Model Engineer

THE MAGAZINE FOR THE MECHANICALLY MINDED

FOREST GATE AND BEDFORD REGATTAS

ONE SHILLING 18 JULY 1957 VOL 117 NO 2930

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SS Cicero: The liner's owners gladly helped in providing information for this model

Urmston open day

The Editor is pleased to consider contributions for publication in MODEL ENGINEER. Manuscripts should be accompanied by photographs and/or drawings and should have a stamped addressed envelope for their return if unsuitable. None of the contents of MODEL ENGINEER may be reproduced without written permission. All correspondence should be addressed to the Editor, Model Engineer, 19-20 Noel Street, London, W1.

Smoke Rings

A WEEKLY COMMENTARY BY VULCAN

READERS will no doubt have noticed a mild metamorphosis in the text and technical drawings of MODEL ENGINEER. Some words, like tailstock, which for a long time have appeared as one word, are now printed in a hyphenated form (tail-stock). Others, like toolpost, are now printed as two separate words (tool post).

Capital abbreviations, which have invariably carried full points between the letters (B.S.F.), are now appearing without the stops (BSF).

What is happening? Well, we are conforming to modern standards. Things have changed a lot since the first issue of MODEL ENGINEER came off the press but we have always tried to keep abreast of the times.

Modern journalism looks with disfavour on too many full points, commas, and other punctuation marks, and for some time now it has been accepted practice to delete the stops in such abbreviations as BBC; so BSF and BA will no longer appear with points.

So far as hyphens and spellings are concerned we have decided to adopt those laid down by Chambers's Technical Dictionary, which is an authoritative work.

With regard to drawings, it will now be our policy to conform to the drawing office standards defined by the British Standards Association.

I hope this will not frighten contributors into rushing out to buy dictionaries. They may do so by all means, but our editorial staff will take care of the change.

Commonwealth ME ?

WHO says the day of the pioneer has passed? From Christchurch, in New Zealand's South Island, come news [this issue, page 76] that that city's enterprising society of model and experimental engineers would like to see established in MODEL ENGINEER a special annual issue embracing each country of the Commonwealth.

As far as New Zealand is concerned the Christchurch society has pledged to lead the way and—very significant this—has no hesitation in stating that her sister clubs in those islands would immediately respond.

The idea is full of exciting possibilities; one that, in my opinion, should have the utmost airing.

How do other societies in the Commonwealth—and the United States, for that matter—feel? It would be most interesting to have your views. Our magazine, as you know, is assuming an increasingly international character.

Signal on show

DOMINATING the floor, as visitors pour into the 1957 Model Engineer Exhibition at the New Horticultural Hall, London, SW, will be a three-quarter ton three-doll, double bracket semaphore

Smoke Rings . . .

signal loaned by British Railways.

Displayed without its stem, so that sightseers may get a crow's eye view of the "works," the signal will nevertheless stand 14 ft high and occupy floor space of 14 ft × 8 ft 6 in.

Similar to those used on the Midland Region, it is equipped with a long-burning type of oil lamp (illuminated by electricity for exhibition purposes) fitted with a pyrometer which operates an indicator in the signal cabin to show whether a lamp is lit or not.

In practice, too, arm repeater contact boxes would also be fitted. These operate repeaters in the signal box indicating whether their respective arms are on or off.

Tickets and posters

You will be able to avoid that long stuffy queue which inevitably forms an interminable crocodile down Elverton Street if you take advantage of this year's arrangements whereby you can purchase tickets in advance from the Exhibition Manager, 19-20 Noel Street, London, W1.

Prices are 3s. for adults and 1s. 6d. for children under 15. For parties of 12 and over there are special rates of 2s. per adult and 1s. for a child.

Four-colour eye-catching posters, 20 in. × 30 in. are now available and I would be very glad to forward supplies to anyone who is in a position to display them.

The Exhibition will be open from August 21 to 31.

CR No 123 to work again

I HEAR that the famous Caledonian Railway singlewheeler engine, No 123, is to work again. This engine—which was the subject of J. N. Maskelyne's "Locomotives I Have Known" series, No 11—was built by Neilson and Co. Ltd, Glasgow, in 1886, as their exhibit at the Edinburgh Exhibition in that year.

Now 71 years old, this engine claims distinction, not only because of her performances on the postal trains that "raced" from London to Aberdeen in 1888, but because she was the last singlewheeler to run in Britain on regular trains. This fine engine retired from regular service in 1935, after a working life just short of 50 years, but has since been preserved and is still in sufficiently good fettle to be capable of running a few excursions for the benefit of enthusiasts.

The idea of putting new life into old locomotives is an excellent one and must pay for itself time and again. It seems to have spread like wildfire in America, and it looks like meeting with popular favour in Britain for years to come—for as long as the old engines can be kept in working order, in fact.

Little sub

I SOMETIMES wonder what stories the pigeons are bringing to Nelson, high up on his column in Trafalgar Square.

Not long ago, for instance, the world's fastest submarine, HMS *Explorer*, arrived in the Thames and berthed at West India Dock for a visit by the First Sea Lord (Earl Mountbatten of Burma) and members of the Board of Admiralty. What gives *Explorer* her speed is the special fuel that she uses: a refined form of a woman's hair bleach!

More recently I went aboard a submarine so small that I had to look twice. She was a 36-tonner, measuring 53 ft 10½ in. in length × 6 ft 3½ in. beam, and it was only by grace of those half-inches that I was able to wriggle inside.

I found HMS *Sprat* (what else could she be called?) at King's Reach near the King's Embankment. You swing yourself down the little conning tower in one movement and then advance feet first until you are surrounded by the usual bewilderment of pipes and instruments. There are two places where you can stand upright.

Comradeship

Sprat was built at Barrow by Vickers-Armstrongs. Power for surface propulsion is provided by a six-cylinder diesel and for diving by a Metropolitan Vickers motor. For armament the little craft carries two side-charges with a total of three tons of very high explosive; or, alternatively, 14 limpet mines. She is, therefore, far more formidable than her size may suggest—a reminder that it was two midget submarines, X6 and X7, which torpedoed the famous *Tirpitz* in Alten Fiord on 22 September 1943.

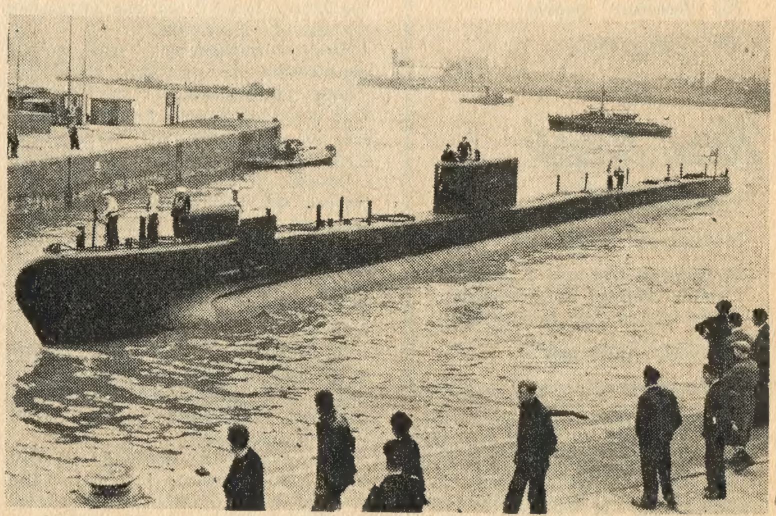
I am sure that all the schoolboys who inspected *Sprat* before her departure for Portland were impressed and thrilled. Her crew of five, frogmen divers with submarine experience, are eager volunteers, and it is not hard to find the reason. A career in a midget submarine offers a life of adventure and comradeship such as we have come to look for in books rather than in our daily lives.

Lieutenant Hans Brill, R.N., the friendly officer in command of *Sprat*, confirmed this impression. "I much prefer *Sprat* to a large submarine," he told me, "because of the obvious family atmosphere. Our ability to swap jobs makes this atmosphere even happier."

And then, a few mornings later, little *Sprat* led off the BBC news, and her pictures were on the front pages.

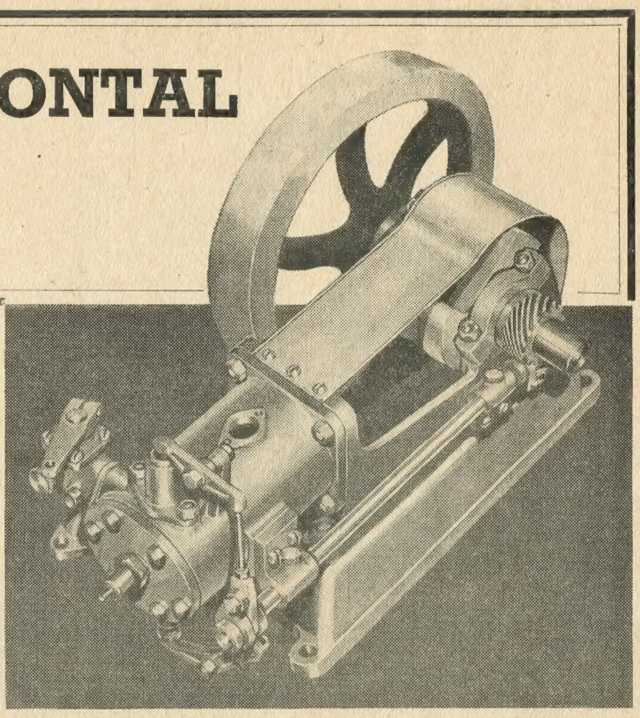
Cover picture

This is the season for regattas, and the normally becalmed waters of the clubs' ponds are now rudely ruffled as the power boats show their paces. Meridian writes of the Forest Gate and Bedford regattas on pages 84 *and* 85.



EXPLORER, *the fastest submarine in the Royal Navy and one which, it is said, will never fire a torpedo*

A 60 c.c. HORIZONTAL GAS ENGINE



Artist's impression of the 60 c.c. horizontal gas engine

EDGAR T. WESTBURY begins a new series on an adaptable and simply built power unit

IN recent years constructors of miniature i.c. engines have mainly concentrated their attention on high-performance, fast-revving, engines suited to the propulsion of competition models.

While there are many who would argue that this is the most important line of development, it does tend to confine design to a narrow channel and lead to the neglect of many interesting and varied types of engines, which are just as effective in their own sphere as those whose only purpose in life is to produce the last ounce of efficiency in relation to their size.

One of the types which was very popular in the early days of model engineering, but seems now to have become almost extinct, is the horizontal open-type stationary engine, designed to run at relatively low speed, either on gas or liquid fuel. At one time castings and parts for the construction of such engines were available from several firms, a notable example being the Stuart Turner 600, the design of which was based on that of the large National gas engine which then supplied power to the Stuart Turner works.

No doubt the decline of interest in this particular type of engine in recent years may be attributed, in part at least, to the fact that few model engineers of the present generation have seen the full-size engines at work. However, those old enough to have had experience with them will agree that they were not only a serious rival to the steam engine for driving small-sized and medium-sized factory machinery, but also just as interesting, and gave very little trouble in running and maintenance.

My early experience in engineering was acquired in a works employing about 100 men, in two machine shops each driven by a Crossley gas engine rated—I believe—about 25 to 30 h.p. In all the time I was there, the only involuntary stoppages were due to the infrequent breakage of porcelain ignition tubes, which were replaced in about five minutes. Maintenance and periodical overhauls were carried out during weekends and holidays, and, of course, those modern nuisances of "power cuts" and "load shedding" had not then been invented!

A few years ago I published an account of reconstruction work carried out on a very ancient and primitive example of a small gas engine, which excited a good deal of comment.

In replying to some of the correspondence on the subject, I dropped a casual hint that I might be prepared to produce a design for an engine of an improved type, but still adhering to the general features of the orthodox horizontal open-type engine. I have not been allowed to forget this . . . many readers have assured me that it would be very popular among constructors. Because of other demands, it has taken me quite a long time to get down to completing this design, but I trust that the enthusiastic supporters of the idea have not tired of waiting.

In the rebuilding of the old engine, the extent to which design could be improved was severely restricted, and most of the improvements were purely functional; but a great deal was learnt in carrying out this work, and it has been possible to apply some of this experience to the new design. Several very important considerations have been taken into account in deciding the essential features of the design, and the primary requirements may be listed as follows:

1 The engine must conform, in general features and appearance, to the type of gas engine most popular in its day, but at the same time incorporate such improvements as are possible in the light of modern knowledge to promote efficiency and reliability.

2 It must be of a size sufficiently large to produce useful work, and to avoid the need for small, delicate parts or adjustments, yet enabling all components to be machined with the aid of a 3½ in. lathe by straightforward methods.

3 All materials, including castings, bar stock, and ready-made components, must be of such a nature as to be within the scope of the model supply trade or small foundry accustomed to normal model work.

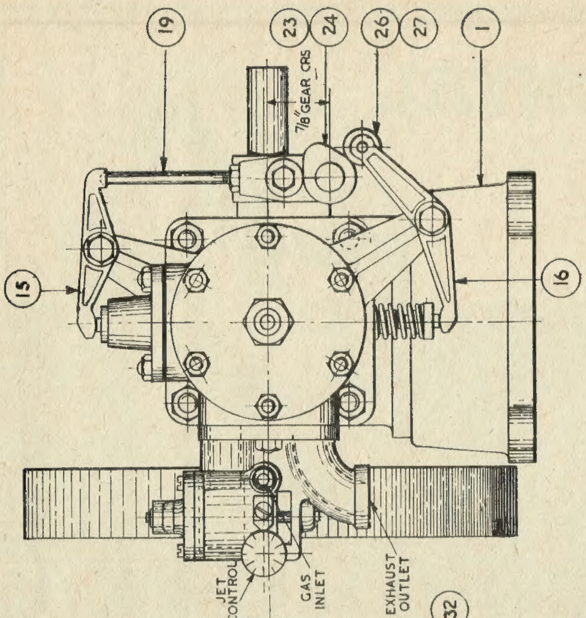
4 The design must be adaptable, to suit the requirements of constructors who have individual preferences for details, or for various kinds of duties; also to make the engine capable of running either on gas or liquid fuel without mechanical alteration.

It will be generally agreed that this specification amounts to a pretty tall

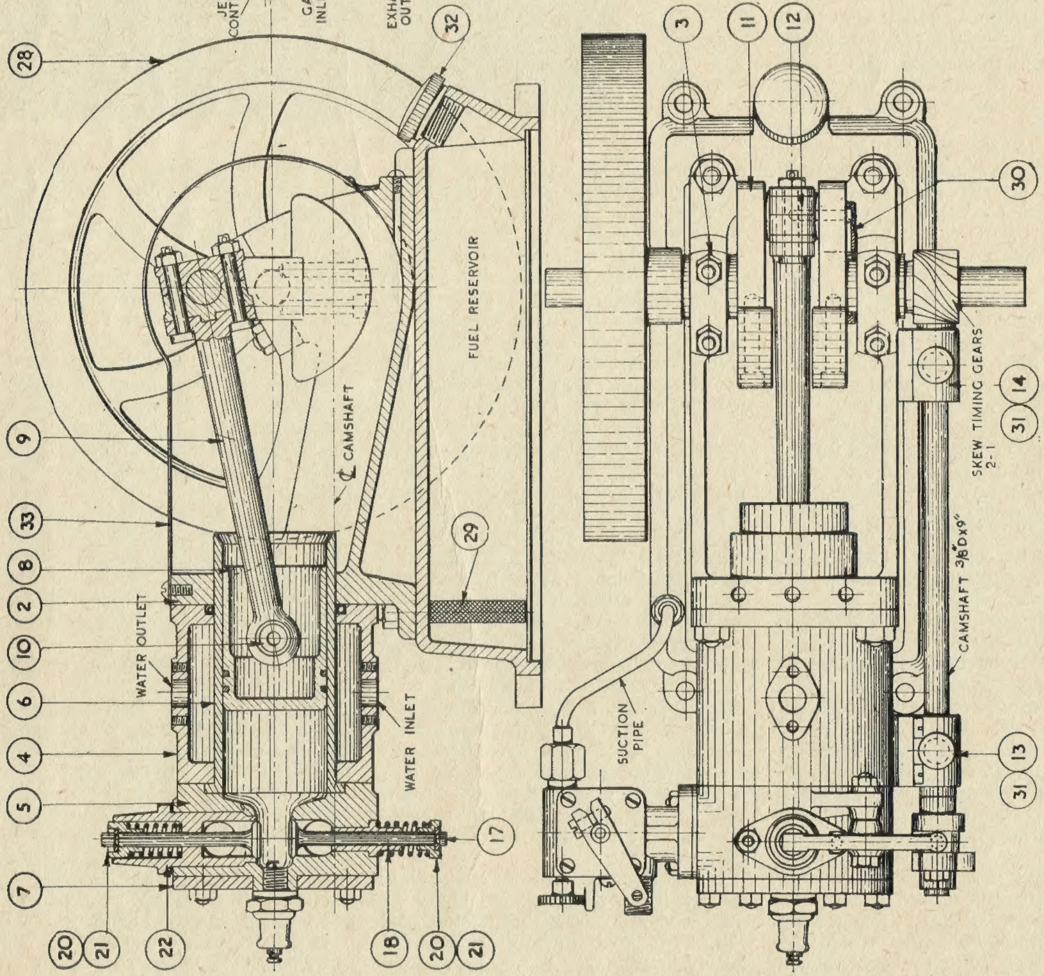
order, but by studying all aspects and redesigning every component about half a dozen times, I believe I have complied with the foregoing conditions. Unfortunately, I cannot claim that an engine conforming to this design has been built and tested, but it has the backing of many years of experience and, as readers will know, I like to feel the initials ETW mean Engines That Work.

GENERAL DESIGN

The engine has a bore of $1\frac{1}{2}$ in. and a stroke of 2 in. giving a displacement capacity of just over $3\frac{1}{2}$ cu. in. or just under 60 cu. cm.; the bore-stroke ratio is thus a little lower than those usually adopted for horizontal gas engines, but more in keeping with modern ideas. Stroke-bore ratios are logically related to rotational speeds, but there are no fixed rules in this matter, and whereas in the old days the tendency was towards extremely



Plan view and side and front elevations of the engine



General arrangement of the Centaur gas engine

long stroke, it is now much more usually in the other direction.

As to power output, I would prefer not to make any definite claims because my experience is that engines made by different constructors have different power characteristics, depending on accuracy and minor details, and the publication of performance figures, however well founded, always lays one open to argument—either with those who fail to obtain the specified results or with the armchair critics who compare them with those claimed for some other engine (usually a totally different type), or what should "theoretically" be possible.

Full-size engines were often rated on a purely nominal basis, though many makers would guarantee brake horse power "tested at sea level." Maximum power is, however, largely dependent on running speed, and small engines, in particular, need to run fairly fast to develop reasonable efficiency; those who insist on a low running speed must not expect a high power output for a given engine capacity.

Engine speeds

It may be mentioned that engines of about 8 to 10 horse power were not usually run at speeds in excess of 350 to 400 r.p.m., while 1 h.p. engines generally ran at 450 to 500 r.p.m. In the case of the reconstructed gas engine referred to, I found it ran quite happily at speeds of 1,500 r.p.m. or more, provided that lubrication was carefully watched; this is rather a limiting factor in the speed of any engine having all main working parts exposed.

The general arrangement of the engine conforms to orthodox practice, having the characteristic deep bedplate incorporating the main bearing housings and the strutted vertical bracket to carry the cylinder. It was fairly common to cast the cylinder, or at least the outer jacket, integral with the bedplate, but this was decided against in the present case, as it tends to complicate machining problems to some extent.

The design of the bedplate, or "body," has been simplified as much as possible—not only for the same reason, but also for convenience in casting. Complicated coring is best avoided in small castings, if it is possible to do so, and loose pieces on the pattern, though they may be a means of avoiding cores for a one-off job, are liable to get lost, damaged, or wrongly located in repetition work.

One feature of design which is strictly conventional is the long side camshaft, driven by spiral or "skew" gears; this became almost universal on full-size engines, and has much to commend it, as it provides plenty of space for bearings, cams and other attachments, and facilitates fitting of these parts. It also lends itself admirably to a type of cylinder head or "breech end" as it was often called —in which the valves are efficiently located and readily accessible—and heated surfaces can be adequately water-jacketed. A similar head was used with great success in the engine of the ME Road Roller.

Wet liner cylinder

The cylinder is in the form of a "wet" liner which does not need to be made an interference or shrink fit in the jacket, being located and held by a narrow lip at the head end, and free to expand at the outer end through a rubber packing grommet. This liner may with advantage be made from centrifugal or chill-cast iron tube; steel is permissible, though it is much inferior to iron for wear unless a high-tensile grade is used.

This, however, is more difficult to obtain and machine. Extensive use is made of aluminium alloy in the structural castings, mainly for convenience in casting and machining, though it was never used in the full-size engines, and this feature is, of course, optional.

Either a solid single-piece crankshaft, or one built up by brazing, may be employed; in the former case, rectangular steel bar is suitable, the balance weights being made separately in steel or cast iron and attached by sunk-head tension screws.

A single flywheel is specified, and although two may be fitted I do not consider this to be of any special advantage. One difficulty of fitting a flywheel on the timing side is that it is bound to stand out a good way from the bearing, which may possibly lead to trouble unless an additional outboard bearing—always a nuisance to line up in a small installation—is fitted.

The recommended method of ignition in this engine is by high-tension spark, using either a magneto or coil and battery. Standard sparking plugs, either ⅞ in., 10, 12 or 14 mm. may be fitted, as found most convenient. Other possible means of ignition include the low-tension internal-break type of plug (though I have not made any provision for this as I do not consider it offers any practical advantages), electric heater or "glow" plug, and tube ignition.

A special carburettor has been designed for the engine, providing for use with gas, petrol or paraffin fuel, without structural alteration. It may be mentioned that although there is no *basic* difference in engine design for working on either gaseous or liquid fuel, the majority of full-size gas engines could not readily be adapted to use the latter, because of the specialised mechanism for admitting or regulating the gas supply.

In most cases separate valves were fitted for gas and air, the former being subject to control by the engine governor, which reduced or totally cut out the gas supply at excess speed. Experience shows, however, that a mixing device or "carburettor" of suitable design can be used to admit and control gas just as effectively as liquid fuel.

No governing arrangements are shown in the general arrangement drawings of the engine, but a governor has been designed as an optional fitting, and can be arranged to operate on the throttle valve of the carburettor as an alternative to manual speed control. For use with liquid fuel, a low-level reservoir is formed in the base casting, the fuel being fed by suction to the carburettor. Paraffin (kerosene) cannot be used to start the engine from cold, so that it will call for the addition of a small auxiliary tank and a change-over cock so that petrol can be used until the engine has warmed up.

Visual lubricators

Apart from the provision of suitable oilways and passages for the supply of oil, no details of lubrication arrangements are shown in the drawings as these may be varied to suit requirements. For normal running, sight-drip-feed lubricators, as used on most full-size engines of this type, are generally suitable, so long as they are properly adjusted and replenished as necessary. The lubricators used on the reconstructed engine were of the type supplied for Myford lathes, but are obviously overscale for a small engine, and constructors may prefer to make their own in a more suitable size.

Three of them are required, one for the cylinder and one for each main bearing; crankpin lubrication is provided by a "banjo" or centrifugal lubricator fed from the inner end of the timing side main bearing. The camshaft bearings have wick syphon lubricators.

If, however, the engine is intended for continuous full-load duty, more positive methods of supplying oil to all important bearings would be desirable, and if the demand warrants it this will be provided for.

In subsequent articles, I propose to describe the methods of machining and fitting the various components, giving details of permissible modifications to suit individual requirements or preferences.

● *To be continued*

MODEL ENGINEERING IN NEW ZEALAND

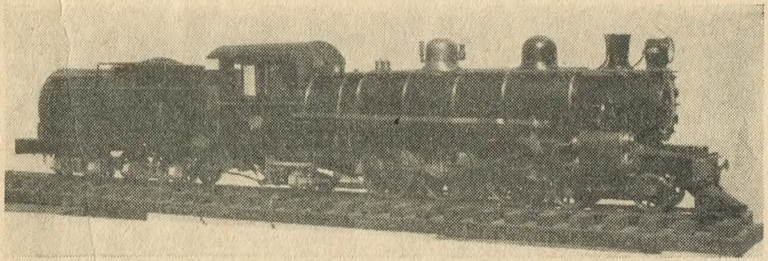
A pictorial review of the Christchurch Society of Model and Experimental Engineers, a well-knit and progressive club Down Under

THE Christchurch club got under way to a good start on 31 May 1933 when 29 people attended an inauguration meeting. Rules and membership fees were discussed and a lot of spade work accomplished.

To swell club funds three exhibitions were held at the annual agricultural and pastoral show in Christchurch. With nearly 145,000 inhabitants, it is the chief town of the Province of Canterbury.

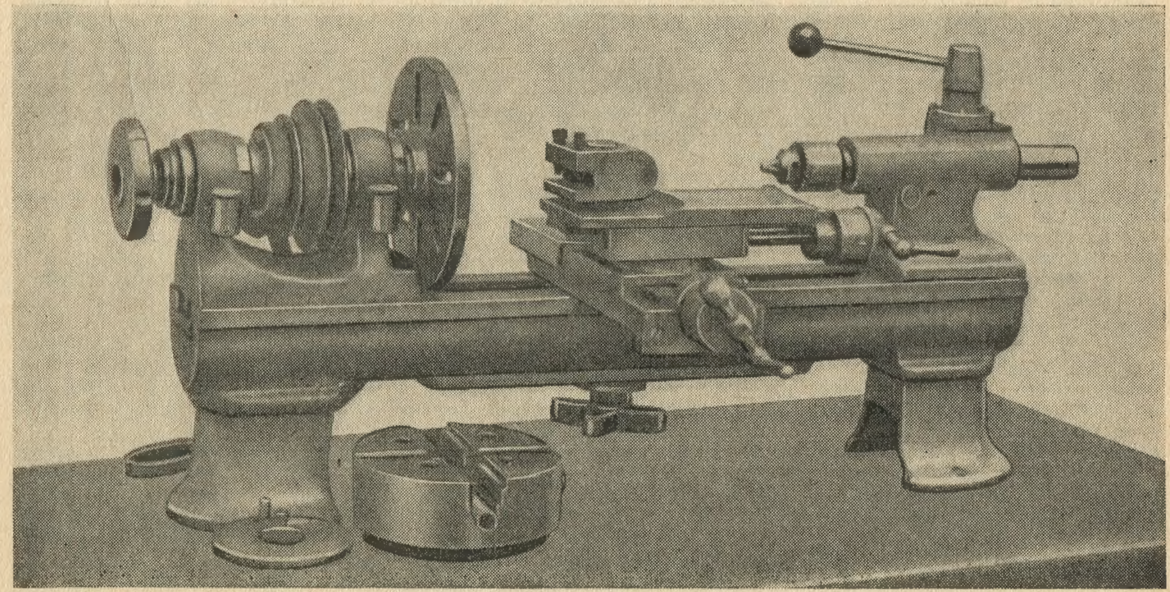
The entrance fees, sixpence for adults and threepence for children, brought in enough coin of the realm to hire a reasonably well equipped workshop. But a particularly hungry gas engine, which drove the plant, rapidly consumed the funds ! The society finally settled in a double garage which was offered by the father of the treasurer at a very low rental.

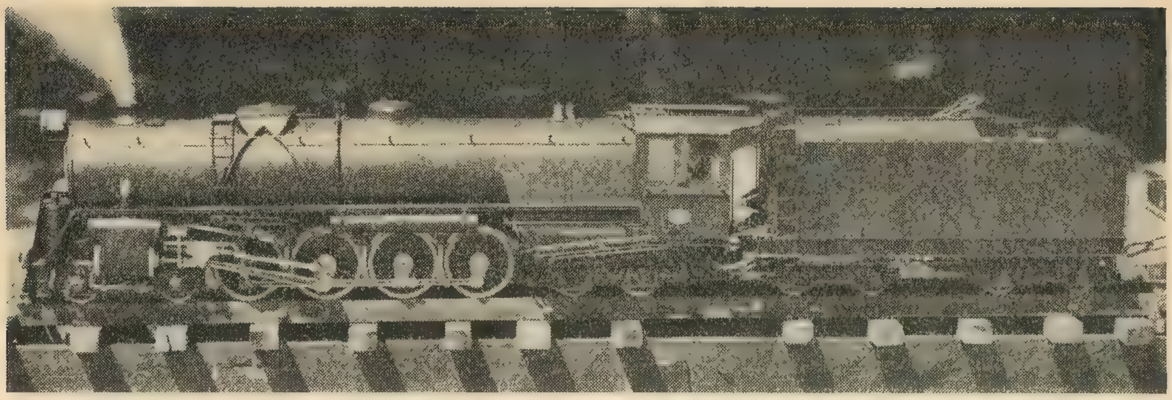
This accommodation served the society well until the war, being the



Left: *A 2½ in. gauge ¾ in. scale New Zealand Government Railways Type Ab locomotive by L. Walcott Wood*

Below: *A precision lathe by H. Powell*





A 2½ in. gauge ¾ in. scale New Zealand Government Railways Type Kb locomotive by J. Harrison. The "b" is the code letter for booster engine in the trailing bogie—with which the model is equipped

scene of many pleasant evenings. At the outbreak of the war a few stalwarts —mostly men of the first world war —kept the flag flying while the rest of the membership served in various branches of the Services.

When members assembled again the need for a clubroom, workshop and running track was felt to be urgent. Then, with funds obtained by exhibiting models and raffling a drilling machine and a lathe at local industries' fairs, the society was in a position to build. Christchurch City Council generously donated a portion of a reserve at a peppercorn rental and the Government donated £150 towards the clubroom and workshop. This was built by the members and is 32 ft × 16 ft.

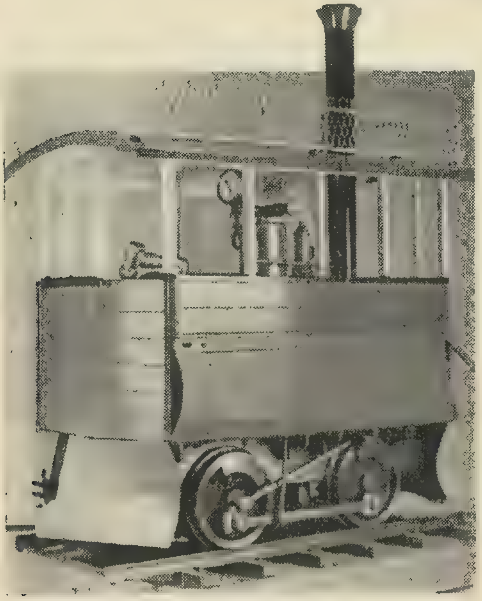
The workshop has a lathe, shaper and a few tools. It is connected with the sewer and h.p. water supply, thus full facilities for brewing the

Above: Three members find an odd hour for some tidying-up work at the club's multi-gauge track

Above, right: AYESHEA *by J. Harrison*

Right: RAINHILL *by H. Powell*

Model engineering in New Zealand...



Above: A $3\frac{1}{2}$ in. gauge $\frac{3}{4}$ in. scale steam tramway locomotive by J. Caverhill (side cover raised)

Right: A microscope by H. Powell

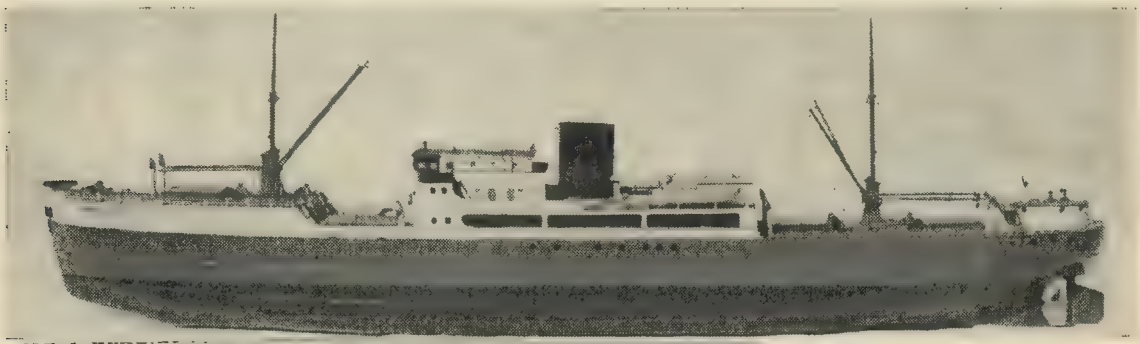
welcome cuppa are provided!

The multi-gauge track ($2\frac{1}{2}$ in., $3\frac{1}{2}$ in. and 5 in.) is now complete with turntable, steaming bays and water point. It has parallel straights with semi-circular ends and is 1/13 mile.

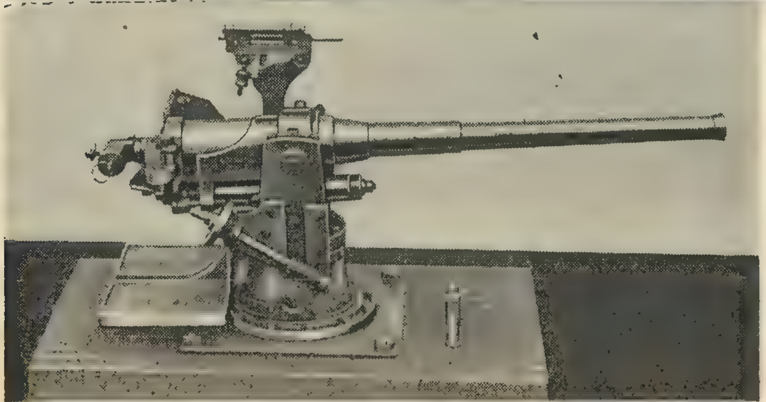
Membership of the club is fairly steady at about 40.

It was suggested at a club meeting that MODEL ENGINEER be approached on the possibility of publishing a special annual issue for each country of the Commonwealth.

The Christchurch society would certainly play its part in supplying an article for such an issue and feels confident that sister clubs in the Dominion would co-operate. ▣



Above: A steam-driven model cargo carrier—its length is 3 ft 6 in.—by J. Harrison

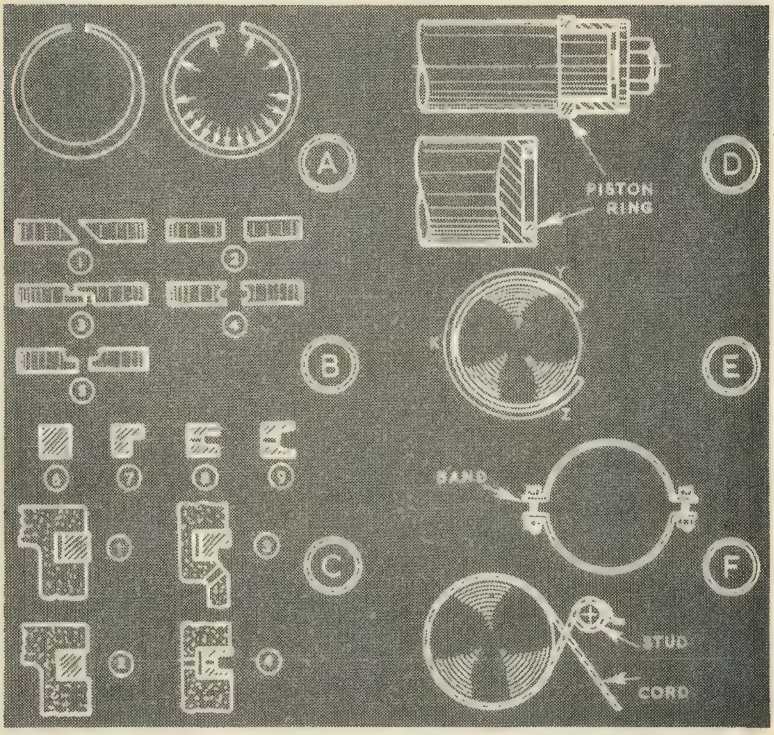


Left: A naval gun by H. Powell

PISTON RINGS

By GEOMETER

BEGINNER'S WORKSHOP



THE original and main purpose of piston rings, whether on steam or internal combustion engines, has always been to prevent pressure leakage or blow-by from the working side of the cylinder to the exhaust side or crank-chamber, as the case may be; though hardly less important, with single-acting sump-lubricated engines, is control of oil, which is accomplished through special types of rings.

Double-acting steam engines, petroil-lubricated two-stroke engines, and four-stroke engines running on splash or total-loss lubrication, need only pressure or compression rings; but four-stroke engines as in cars and modern motor-cycles, also require oil control rings—at least one on each piston, the two types being distinct.

The modern pressure or compression ring, particularly the commercial product, is of uniform section; and to ensure uniform outward thrust at all points on its circumference is usually "hammered" internally, as examination will often show—the hammering being heavier and more concentrated away from the gap, as at *A*, right. To some extent, however, the same effect of uniform outward pressure can be achieved by machining rings eccentrically, as at *A*, left, which at one time was done for large rings, and may still be employed in model sizes.

Ring joints may be as at *B*: (1) scarf joint; (2) plain butt joint; (3) stepped joint, to avoid a gap for blow-by. At the present time, the plain butt joint is perhaps the most common, with adaptations when a ring must be located as on a two-stroke engine; (4) location on a central peg in the groove; (5) location on a peg in the top edge of the groove. Sections of rings are: (6) square or rectangular for pressure or compression rings; (7) stepped for oil control; (8) slotted for oil control; (9) grooved for oil control—giving a more powerful action.

Standard fittings for piston rings are as at *C*, in square-sided grooves with clearance at the bottom. In normal use, rings may stand slightly proud of the surface (1); but it should be possible, for testing, to push a ring with a finger all round below the surface (2), failing which it might not be possible to fit the piston to the cylinder. Below a stepped ring, the edge of the groove is chamfered (3), and the chamfer drilled with oil drain holes; and for slotted or grooved rings, the bottom of the groove is drilled (4).

Cast iron is usually employed for piston rings, except special commercial types for oil control, which are of spring steel. For model rings, particularly of steam engines, hard brass or bronze can be used, neither of which is so easily broken as cast iron in small sections—nor subject to rusting.

In making small rings, which is practicable down to about ¾ in. dia., the material, whatever is used, is finished in the bore and the outside left oversize. Each ring is faced smooth at the front, and then parted off carefully, if desired slightly over-width. A piece is cut out at the joint, then the ring closed and mounted on a mandrel, as at *D*, for finishing the outside. This ensures correct diameter with a certain degree of springiness—but it will be realised the original boring must be nominally oversize to allow for contraction when the piece is cut out at the joint.

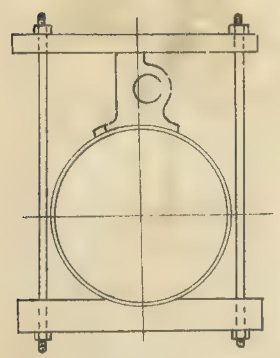
For reducing to width, a ring can be placed in a recessed mandrel, as at *D*, bottom, and lapped or rubbed on fine emerycloth. Clearance at the gap may be given by filing 0.003 in. per inch of bore diameter (air-cooled i.c. engines, 0.004 in. to 0.005 in.).

In fitting rings, three strips of thin metal can be used to bridge top grooves, as at *E*, *x*, *y*, *z*—a method also employed for removal. To fit pistons to cylinders, a metal band, as at *F*, will compress rings; or on car engines—pushing down from the top—a piece of cord can be attached to a stud, wrapped round a ring and the end pulled. ▣

The ALLCHIN ME TRACTION ENGINE

This further article from the pen of W. J. HUGHES deals with the governor

Continued from 16 May 1957, pages 717 and 718



Above, Fig. 1: Clamping the cylinder to the boiler barrel

Below, right, Fig. 3: The general arrangement of the governor

Below, Fig. 2: The Pickering governor, mechanical lubricator and governor driving pulleys

BEFORE starting description of the next bits and pieces of *Royal Chester*, one or two points have arisen in correspondence which may be puzzling other tyros; so let's deal with them here. The first concerns the dimensions given in the drawings of the blast pipe and blower pipe.

I am very sorry to say that an error has crept in here, despite checking and counter-checking of drawings, and the given dimensions are approximately $\frac{3}{8}$ in. too long for both these components. In any event it is advisable to take such dimensions from the job: in building a boiler it is very easy to gain or lose the odd 1/32 in., of course.

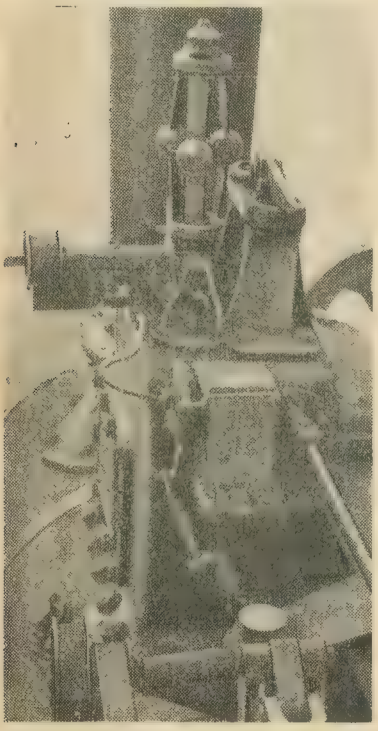
The second point concerns the erection of the cylinder on the boiler barrel, obviously of vital importance to the lining-up of the motion work. First place the boiler-hornplate assembly on its side on the surface plate (remember my tip some time ago about using a piece of second-hand plate glass for this ?).

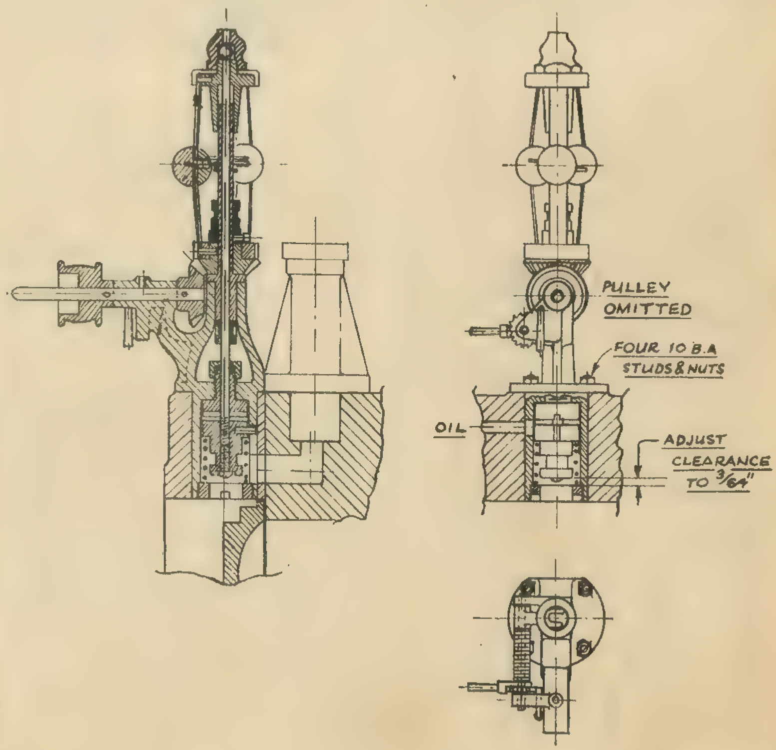
Pack up the assembly until a $\frac{7}{16}$ in. rod passed through the crankshaft bearings is exactly vertical, checked by try square from the surface plate.

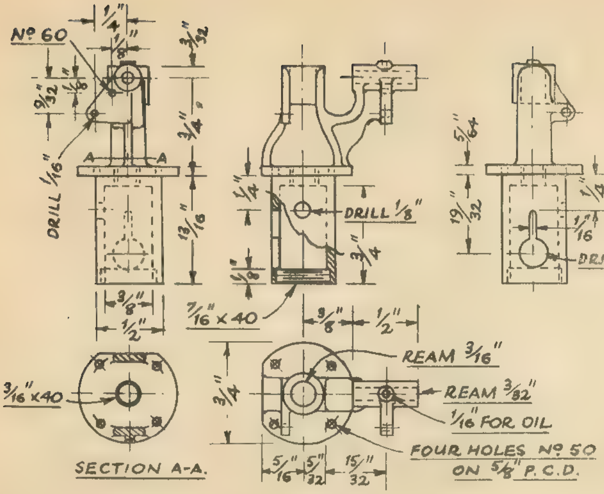
Now with a surface gauge, scribe the exact centre line of the boiler barrel.

Measure from the crankshaft bearing centre line, along the barrel, a distance of $8\frac{3}{8}$ in., stand the boiler on end, and scribe this line round the upper surface of the barrel. If the cylinder block is placed on the barrel with its centre lines coinciding with the two lines just scribed, it should be correctly placed.

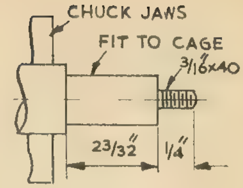
Probably the best way to secure the block to the barrel, while the stud holes in the latter are jig-drilled



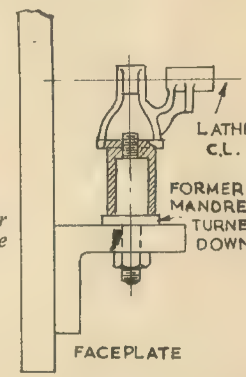




Left, Fig. 4: The governor standard and cage



Right, Fig. 5: The stub mandrel for mounting cage



Right, Fig. 6: Set-up for drilling the spindle hole accurately

through the holes in the cylinder flange, is as sketched in Fig. 1. Two strips of hardwood, one saddled to fit the barrel, are drilled to take two lengths of ¼ in. rod, threaded at either end, and secured by nuts and washers.

When the cylinder block is clamped to the barrel, check centres and lining-up as accurately as possible. Now with a No 30 drill, spot through two of the holes in the end flanges of the block into the boiler. Remember that these spots should only be indentations made by the end of the drill in the copper.

Remove the clamp and block, and drill the holes right through with a No 38 drill. Tap the holes 5 BA, replace the block, and insert two 5 BA screws to hold it. These are only temporary, of course, so round-head or cheese-head will be easier to use. Don't tighten too hard at this stage.

Recheck centres and lining-up, and then for security's sake replace the clamp. Spot through two more holes, this time in the opposite side flanges. Remove the cylinder, drill and tap holes in the barrel, replace the cylinder and secure. It should now be safe enough to spot through the remaining holes at one go, remove the cylinder, and drill and tap. While the cylinder is off, don't forget to drill a $\frac{3}{16}$ in. hole to correspond with the hole for the filling plug in the cylinder flange.

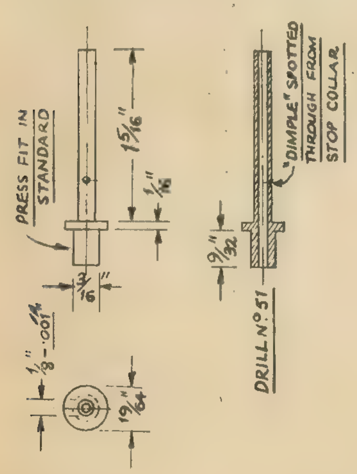
The studs to be used in final assembly should be of bronze: brass or steel would give trouble. The nuts may be held by Easy-flo to the studs for ease of assembly, if desired. A gasket is needed between the cylinder saddle and barrel: this may be of cartridge paper, covered both sides with jointing compound, or a soft metallic one. I use one which used to be advertised in MODEL ENGINEER, though I haven't seen the advert for some time now. A friend tells me he has had good results with the aluminium foil sold for culinary purposes, by the way.

PICKERING GOVERNOR

I think that the governor design for this engine may well be of interest to other steam engine and traction engine builders, since, so far as I can recall, it is the first time that a Pickering governor design has been published in detail, in model form.

The Pickering, of course, suffers against some other forms of governor, especially in a model, because there is no rotative movement on the valve spindle; just a push-pull. When working through a gland, much less effort is required to rotate a shaft than to push or pull it.

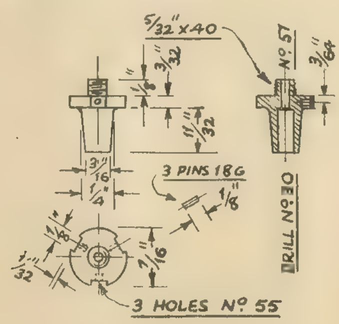
Accurate lining-up, therefore, is an important feature, coupled with a

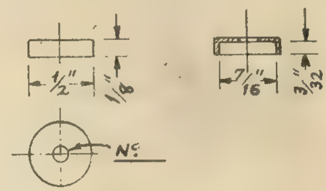


Left, Fig. 7: Governor column

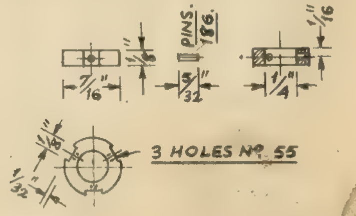
Right, Fig. 9: Governor cap collar

Below, Fig. 8: Governor cap





Below, Fig. 10: Governor lower collar



STAINLESS STEEL

gland packed as lightly as possible, so long as it is steam tight. However, I have arranged the design to include an internal spring, which reinforces the effort of the leaf springs to which the fly balls are attached, and this should improve the performance considerably.

In the long run, whether the governor works properly or not will depend on the workmanship of the builder, and on his patience, too. In any case, for an authentic appearance, it *should* be fitted—governing gear was an essential for any engine which had to drive a threshing machine. Yet one so often sees models of general purpose traction engines without governors !

It will be seen in the general arrangement (Fig. 3) that the main casting includes the standard and the valve cage. Pressed into the standard is a column which carries the rotating parts, and through which the spindle passes down to the valve itself. A $\frac{1}{8}$ in. ball-bearing is interposed between the cap-nut and the spindle, to reduce friction.

The lower end of the spindle is screwed into the valve and locked by a 10 BA screw. A pin pressed into the valve body engages with a slot in the side of the cage, to prevent any rotative movement. Three small grooves are filed in the body to allow steam pressure on the top side of the valve to equilibrate that on the underside.

At the bottom, the cage has a collar screwed in, which forms the throttle opening, and also takes the thrust of the return spring. Just above the collar is a 7/32 in. hole drilled in the wall of the cage to correspond with the passage leading from the regulator valve.

Note that the valve itself has a 3/32 in. groove turned in it to allow a really free passage for the steam right round the chamber and through the orifice into the valve chest. This is essential in order not to "wire-draw" or restrict the normal flow of steam.

The regulator mechanism as fitted is only a dummy: it could have been made to work, but would have had so little effect as not to be worth while. Nevertheless, its absence would have made for a very unrealistic looking governor. In the full-size engine, of course, it was used to make the final adjustment to the governed speed of the engine.

GOVERNOR STANDARD AND CAGE

The casting for the standard (Fig. 4) will have a chucking spigot cast on top. After cleaning up the casting, grip the spigot in the three-jaw chuck

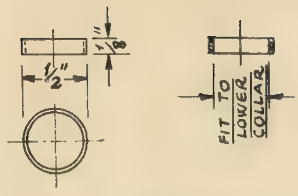


Fig. 11: *Outer lower collar*

and set the cage to run true. Face and centre the end, and support it on the tail-stock centre. Turn the cage to diameter, and face and turn the bolting flange.

Most of the inside waste can be drilled out with an 11/32 in. drill, the interior being finished true to size with a small boring tool, followed by a $\frac{3}{8}$ in. dia. D-bit to the full depth of $\frac{3}{8}$ in.

Using a centre drill in the tail-stock chuck, centre the bottom of the hole and drill right through with a No 21 drill. Tap $\frac{3}{16}$ in. × 40.

Set an internal screw-cutting tool in the tool post and screw cut a $\frac{7}{16}$ in. × 40 thread $\frac{1}{8}$ in. deep in the bottom of the cage.

It is vital that the hole in the top of the casting should be absolutely in line with the cage, which can be ensured by turning a stub mandrel, as in Fig. 5. Screw the cage on to this, cut off the chucking spigot, and face and centre the top of the standard. Drill 11/64 in., and ream $\frac{3}{16}$ in. dia.

Remove the casting from the mandrel, reverse the latter in the chuck, turn on it a spigot say $\frac{1}{4}$ in. dia. × $\frac{5}{8}$ in. long, and screw $\frac{1}{4}$ BSF. It can then be used on a small angle plate, bolted to the face plate, to mount the casting for drilling and reaming the holes for the pulley spindle (Fig. 6) and the regulator spindle. The remaining holes are a matter of ordinary procedure which needs no detailed description.

COLUMN, CAPS AND COLLARS

The governor column (Fig. 7) is a straight-forward piece of turning, but

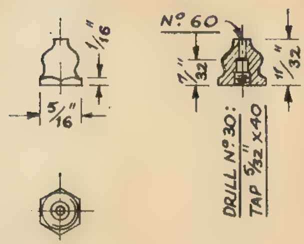


Fig. 12: *Governor cap nut*

note the diameter is given as one thou less than $\frac{1}{8}$ in., to allow free movement to the other parts which will fit on it. Grip a piece of $\frac{5}{16}$ in. mild-steel rod in the chuck, face and centre the end, and bring up the tail-stock centre to support it. Turn the column to length and diameter.

Drilling the No 51 hole down the centre will call for patience. Use plenty of cutting oil, do not force the drill, and withdraw it frequently to clear the swarf. If these precautions are taken, it should run true, but if they are not, it will probably diverge, when the only remedy will be to start again. Drill the hole to $1\frac{11}{16}$ in. deep and part off at that length.

The lower spigot, a press fit in the standard, must be dead true with the hole, and is best turned with the column gripped in a collet, home-made or otherwise.

I have specified most of the governor bright parts in either mild or rustless steel: if the latter is used it must be the free-cutting variety, of course. To make the cap (Fig. 8), grip a piece of $\frac{1}{4}$ in. rod in the chuck, face and centre the end, and drill No 51 to 7/32 in. deep. Turn to $\frac{7}{16}$ in. dia. about $\frac{3}{8}$ in. along, and reduce to 5/32 in. dia. for $\frac{1}{8}$ in. length. Screw 5/32 in. × 40.

Rough out the tapered part of the cap, and part off to length. Make a screw chuck 5/32 in. × 40, screw the cap into it, and finish off the taper. Centre the end, and drill No 30 until the drill meets the No 51 hole.

The turning of the cap collar,

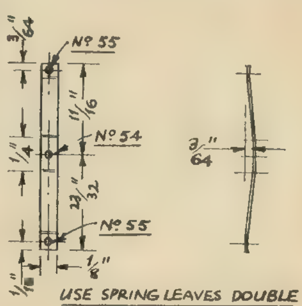


Fig. 13: *Governor spring leaves*

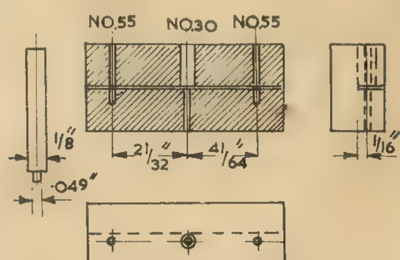
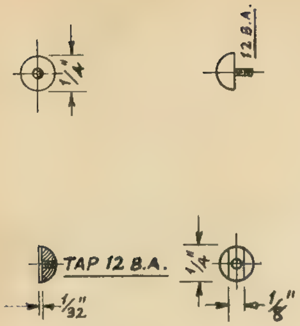
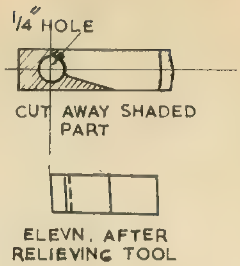


Fig. 14: *Jig for punching the holes in the spring leaves*



Left, Fig. 15: Outer and inner half-balls for the governor



Right, Fig. 16: Making the form tool

lower collar, and outer lower collar (Figs 9, 10 and 11) are quite straightforward. The grooves for the springs in the cap and lower collar may be filed, if you have sufficient confidence in your accuracy. As an alternative, they may be end-milled, and careful setting up or even indexing will be necessary, to ensure that they are at 120 deg. to each other.

For the cap-nut (Fig. 12), use 7/16 in. or 1/2 in. rod; face and centre the end, and drill No 60 to 3/8 in. deep. Enlarge the hole to No 30 for a depth of 7/32 in., and tap 5/32 in. × 40 for rather more than 1/8 in. deep. File or mill the flats to make the 7/16 in. hexagon, and rough the curves to shape. After parting off, the latter may be finished off with the nut mounted on a screwed stub-mandrel.

GOVERNOR SPRINGS

The spring leaves (Fig. 13) may present something of a problem in obtaining the specified material (28 gauge), though I have a worn-out watch in my collection of which the spring just fills the bill.

Six leaves are needed, since they are used double, and a jig will be needed to punch the holes. A block of steel—dimensions immaterial—has a very narrow slot cut in one side, preferably with a 1/32 in. slitting saw, 3/16 in. deep. Drill three No 55 holes to the dimensions given (Fig. 14), and enlarge one of them to No 30 in the part above the slot only.

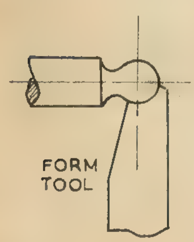
Make a punch, as drawn, from 1/8 in. dia. silver steel, and harden and temper it to light straw colour.

For a start, allow about 1/4 in. extra length on the leaves. Slip one into the slot, and position it so that the punch in its hole comes 3/16 in. from one end. Give the punch a smart biff with a hammer, which should do the trick. Withdraw the punch, slide the spring along, and slip a stub of 18-gauge wire through one No 55 hole in the block and that in the spring. This gives the distance for the central hole, after which the other end hole is similarly punched, but using the other No 55 hole in the block for distance.

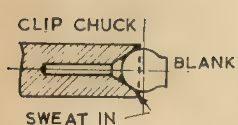
The slight set in the springs is easily done with pliers.

GOVERNOR BALLS

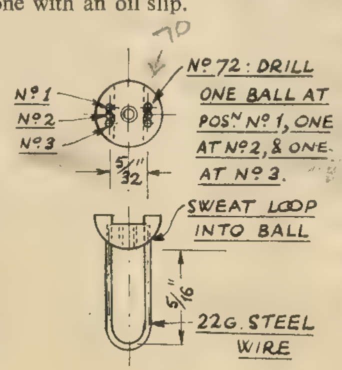
To turn the governor balls (Fig. 15), or rather half-balls, is not difficult, if a form tool is made as in Fig. 16. Drill a 1/4 in. hole in a length of 3/8 in. square section silver-steel bar and cut away, as shown, to leave rather more than a quarter of the hole. With a suitable file carefully relieve the hole to form a cutting edge, and harden and temper to light straw. Hone with an oil slip.



Left, Fig. 17: Finishing the half-balls to contour



Below, Fig. 18: Holding the half-balls for turning



Right, Fig. 19: Fitting the retaining loops to half-balls

By manipulation of the slide-rest handles, rough-turn a ball, with a round-nosed tool. Substitute the form tool, and finish to diameter (Fig. 17), using the mike. Part off to 5/32 in. for the inner halves, and 9/32 in. for the outer ones.

To hold the halves for finishing, grip a stub of 3/8 in. brass rod in the chuck, face and centre the end, and drill No 50 about 3/8 in. deep (to clear the 12 BA tap later). Centre pop against No 1 jaw, remove from the chuck, then sweat a blank for an outer half into the centred end of the cup chuck (Fig. 18).

Using light cuts, turn down to 0.051 in. dia., and screw 12 BA, using the tail-stock die holder. Repeat three times.

With the inner halves, after sweating into the cup chuck, face off to size, centre, drill No 62, and tap 12 BA.

Remove from the three-jaw, and set out for the two No 72 holes. Note from Fig. 19 that in one ball the holes are above centre, in one *on* the centre line, and in the third below centre. Drill the holes right through the ball.

Mount the cup chuck on the vertical slide, and end-mill the 1/8 in. groove across its face, at right angles to the centre line of the holes.

● *To be continued*

A lecture on lathework

An interesting and practical lecture on lathework has been produced by Myford Engineering Co. Ltd, Beeston, Notts.

It consists of a single-frame 35 mm. filmstrip, of 45 frames, illustrating a comprehensive range of lathe operations, including set-ups and tooling layouts. And while these deal with work actually carried out on Myford ML7 lathes, the methods are generally applicable to all small metal-working lathes as used in home workshops and light industry.

A full commentary on the filmstrip illustrations is contained in the leaflet (Publication No 726) which is issued with it, but is also obtainable separately, and in itself forms a useful and practical instruction handbook. The lecture has been prepared by a well-known writer and demonstrator, and is expressly suited to the requirements of model engineering societies and technical schools.

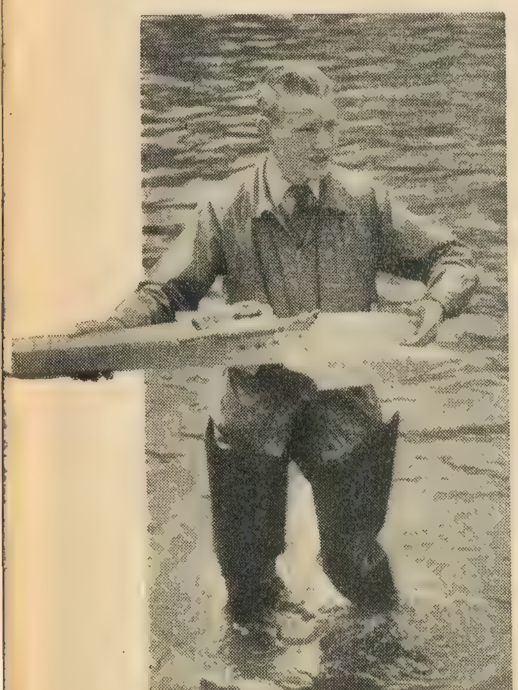
A copy of the filmstrip, together with the commentary, can be obtained from Myford for 6s., post free.

Mr Chapman, of King's Lynn, starting WISHBONE

MPB REGATTAS

1957 has the makings of a successful year. These signs were further strengthened when MERIDIAN attended the Forest Gate and Bedford regattas

Top: W. Everitt, assisted by his son, drying out NAN II *following a capsizing Below: J. Skingley, jun., with a B class hydroplane from the* SPARKY *stable*



THE attendance at the early regattas of the season give every indication that this year will be a very successful one. At both the Forest Gate and Bedford events—held on successive weekends—excellent support was forthcoming from many clubs.

The Forest Gate regatta took place, as in previous years, at Victoria Park, East London. Competitors included a strong contingent from Southampton and Portsmouth besides representation from London and Midland clubs. A heartening feature was the appearance of many new boats—particularly of straight-runners—making their first competition outings.

That Pandora!

One craft that aroused much interest was Peter Jesset's *Pandora* (Blackheath). This boat is about 4 ft 6 in. long and is fitted with an unusual, but practical power plant. It took the form of a small J.A.P. industrial engine of 34 c.c. fitted with air cooling fan and shrouding. This engine—it was purchased second-hand—should make an extremely reliable plant, but it is to be hoped that the enterprise is not emulated by larger engines of this type!

A strong wind made matters tricky for every boat, and in the speed events no one did very fast runs. The main interest centred on Class B, which provided the largest entry and included several new jobs.

One of the latter was a replica of the original *Sparky*. This time the builder was Mr Boby of the Portsmouth Club. M. Daly (Blackheath), the new Class B record holder, had a new hull—the successor to *Nipper* 2. Neither of these hydroplanes did very well but, then, "first time" outings are notoriously unsuccessful!

Tom Dalziel's *Naiad* 3 won this race at a speed of 43.6 m.p.h.

At the close of the boat's second run an attempt was made to switch off in the usual way and, although the knock-off lever went down, the boat continued on its way; but during the next lap, to everybody's astonishment, the engine jumped gracefully overboard! Luckily, no damage occurred in this odd mishap, which was due to the mounting bolts being loosened by vibration.

RESULTS

Event 1: 80 yd nomination

1 C. Webb (Victoria), *V* 36: 0.6 per cent error.
2 A. Evans (Victoria), *Maycock*: 0.8 per cent error.
3 W. Peterkin (Forest Gate), *FG* 30: 1.8 per cent error.

Event 2: 500 yd race for C restricted hydroplanes

1 K. Hyder (St Albans), *Slipper* 5: 52.72 m.p.h.

2 W. Everitt (Victoria), *Nan*: 43.52 m.p.h.

Event 3: 500 yd race for Class C hydroplanes

1 R. Phillips (St Albans), *Foz* 29: 46.91 m.p.h.

Event 4: steering competition

1 J. Cleary (Blackheath), *Via Media*: 11 points.

2 T. Falconer (Blackheath), *Lulworth*: 10 points.

3 R. Griffiths (Victoria), *V* 23: 9 points.

Event 5: 500 yd race for Class B hydroplanes

1 T. Dalziel (Birmingham), *Naiad* 3: 43.6 m.p.h.

2 J. Skingley (Victoria), *V* 26: 42.6 m.p.h.

Event 6: 500 yd race for Class A hydroplanes

1 W. Everitt (Victoria), *Melody*: 56.6 m.p.h.

2 J. Benson (Blackheath), *Orthon* 2: 49.9 m.p.h.

THE BEDFORD REGATTA

For the past two seasons Bedford MES has been forced to cancel its model power boat regatta because of the prolific growth of weed in the Longholme lake. This time, however, it was decided to try a date earlier in the season—before the weed could gain too great a hold. The result of this policy was evident, with a good attendance and a fine sunny day to order!

In the steering event a more generous width to the bull than usual enabled the scoring to reach to fairly high marking, especially for the length of the course. At one time it seemed likely that many reruns would be necessary to determine the winner, but a fine performance by Jim Cleary (Blackheath) with *Via Media* put the issue beyond doubt. This boat scored a bull on each run, thus securing a maximum of 15 points.

The racing events brought forth entries from many well-known exponents, but a notable absentee was George Lines, who is now in the United States, where he hopes to settle. Followers of hydroplane racing will be interested to know that at least two of his 15 c.c. jobs remain behind in good hands and will be entered in races as often as possible.

No records

Longholme lake has quite a good reputation for being a fast water, and some high performances were witnessed though not up to record-breaking speeds. On this occasion the fastest speed of the day was achieved by Ken Hyder (St Albans) with *Slipper* 5 at 66.41 m.p.h. First place in Class B was very closely contested by Messrs Dalziel and Jutton, the difference in speed being only 0.54 m.p.h. over the 500 yards.

By the end of the day one or two boats appeared to be suffering from engine trouble. J. Benson's *Orthon* 2 failed to finish on the second run with the engine making weird noises and likewise Dick Phillips' *Foz* 2 was misbehaving. Thus the second run was rather poor.

Above: Dick Phillips and Ken Hyder preparing FOZ II *and* SLIPPER V *for the fray*

Left: Bill Morss takes steady aim with EDIE *in the steering competition*

RESULTS

300 yd Class D race

1 K. Hyder (St Albans), *Slipper* 3: 40.91 m.p.h.

Nomination event

1 C. Drayson (N. London), *Nippy*: 0.4 per cent error.

2 J. Cleary (Blackheath), *Via Media*: 1.2 per cent error.

500 yd Class B race

1 T. Dalziel (Birmingham), *Naiad* 3: 52.72 m.p.h.

2 F. Jutton (Aldershot), *Nike*: 52.18 m.p.h.

Steering Competition

1 J. Cleary (Blackheath), *Via Media*: 15 points.

2 W. Morss (Victoria), *Edie*: 13 points.

300 yd Class C race

1 R. Phillips (St Albans), *Foz* 2: 56.19 m.p.h.

300 yd Class C restricted race

1 K. Hyder (St Albans), *Slipper* 5: 66.41 m.p.h.

2 T. Everitt (Victoria), *Nan*: 59.11 m.p.h.

500 yd Class A race

1. J. Benson (Blackheath), *Orthon* 2: 60.88 m.p.h.

2 W. Everitt (Victoria), *Melody*: 59.46 m.p.h. ▣

50 years ago

Adopting the New Steam for models . . . when do-it-yourself wasn't a cult . . . a 'wonder' geared compound locomotive

FIFTY years ago model engineers were talking of the New Steam. This was the name given to the flash and semi-flash systems which at that time had already proved themselves commercially.

During the summer of 1907 readers of MODEL ENGINEER, between listening to the pierrots and negro minstrels, were enjoying a series of articles by W. L. Blaney, whose pioneering work in live-steam modelling deserves to be remembered by the flash-steamers of today. "Now that the flash and semi-flash systems of steam generation have proved so superior for certain classes of work commercially, it is time," he wrote, "for model engineers to consider the advisability of adopting the new principles for models in order to get better results."

Flash-steam was, it seems, made possible by an American. "There is some difficulty," explained W. L. Blaney, "in discovering who was the first to experiment with the continuous pipe boiler; but the writer, in his endeavours to penetrate these clouds, has come across one curiosity that is of interest. There is a well-executed engraving of a steam fire engine, horse drawn—the engine, not the engraving. It is a matter of regret that no letterpress accompanies this design, which appears in an old portfolio of American machinery lent to the writer by Mr Thomas Dysart. The only particulars available are that the inventor and patentee was one Abel Shawk, of Cincinnati, Ohio, the date of the patent being 1853, the scale of the drawing 1½ in. to the foot.

"The boiler is a continuous tube made up of several elements, gradually increasing in diameter from the water inlet to the steam container, and coupled together by cast bends. Not the least interesting feature of this engine is that, with the exception of the road wheels, there are no rotating parts."

Builders of model locomotives were not, however, much attracted by the New Steam. Its adoption, said Mr Blaney, would mean such radical changes in the design that the chief charm of a model locomotive—its resemblance to the original—would be lost.

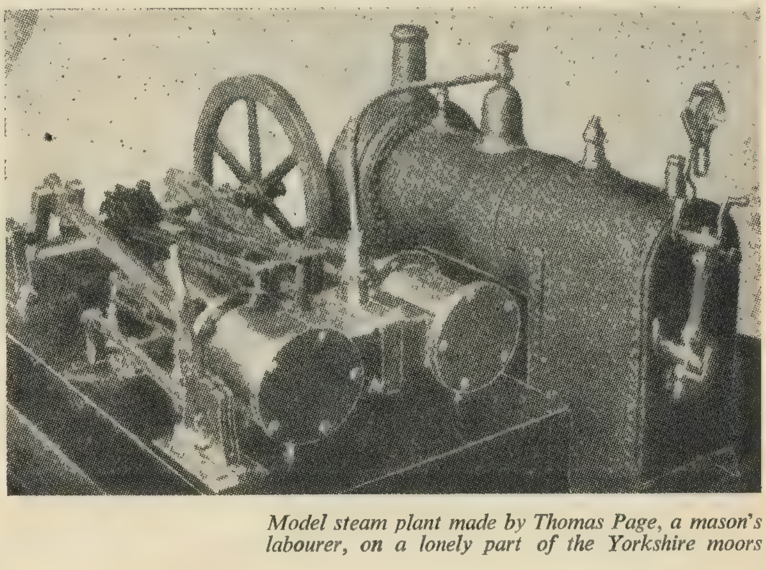
There was, he thought, a field for its use in the modelling of motor-cars and motor-coaches "such as are now in use on branch lines of several railways"; but it was the marine modeller who was most likely to be interested. "There are practically no bounds to the designs of hulls, which may range from a 'tub' to a hydroplane, and as to the motive power—well, anything from a Serpollet installation to a pair of reins and a mermaid !"

It was Serpollet, of course, who discovered that the heat-dissipating property of water in bulk could be kept to a minimum by joining up the feed heater with the superheater and cutting out the boiler.

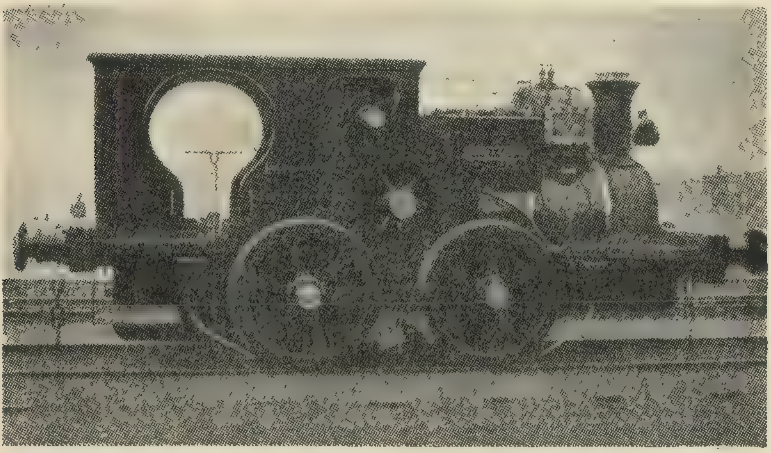
WINDING WOOL

FAR from being devoted to instructional articles, ME in those days gave a good deal of space to subjects of more general interest, so that its pages reflected the world that the modeller inhabited and also, to some extent, the still wider world beyond. Consequently ME of 1957 is, as a matter of confirmable fact, closer to the "old" magazine, and to the atmosphere in which the movement was born, than many readers of today may imagine.

It was not unknown for an issue to contain only one article actually describing the construction of a model—and this single article might even then be part of a serial. In 1907 Volume XVI closed with the seventh instalment, in a little less than two pages, of Henry Greenly's "Design for a Small Model Undertype Engine." This was the only feature directly related to building a model. Three pages, on the other hand, were



Model steam plant made by Thomas Page, a mason's labourer, on a lonely part of the Yorkshire moors



Two views of the Aveling and Porter geared compound locomotive

devoted to a wool winder—an example of do-it-yourself half a century before it became a cult in Britain and the USA.

A GEARED LOCO

THE 1907 issues contained a generous amount of news and notes such as we find nowadays in Smoke Rings. One of the topical notes that summer introduced readers to a geared compound locomotive in the yards of the Metropolitan Amalgamated Railway Carriage and Wagon Works at Saltley, near Birmingham.

This engine had been built by a company which is held in great respect by traction-engine enthusiasts of the 1950s—Aveling and Porter of Rochester. "It runs upon four wheels, and is practically one of the firm's ordinary type compound road locomotives mounted upon special wheels for rails and fitted with buffers and a buffer beam at each end. The cylinders, one high-pressure and one low-pressure, are carried on top of the boiler, immediately behind the chimney, and the motion imparted to the crankshaft is transmitted through suitable gearing to the running wheels, the coupling bar of which remains stationary, although at first glance it might well be taken for an ordinary coupling rod rotating with the wheels.

"The entire working parts of the engine are on the top of the boiler within view of the driver, and the bearings of the driving axle, crank, and countershafts are all carried by the sideplate brackets, the gearing itself, together with the working parts of the locomotive, resembling as much as possible those of an ordinary road locomotive.

"The wheels are fitted with steel tyres, and are under the control of a powerful brake acting on all four wheels. The crankshaft carries a flywheel for driving fixed machinery, enabling the locomotive to be used as a powerful semi-fixed engine.

"The engines of this type are made in varying sizes; they will ascend inclines of 1 in 20, and can be made to work on tramways of 3 ft 6 in. gauge and upwards, as well as round curves of from 35 ft radius."

According to the makers, the engines had proved successful in all parts of the country and were capable of hauling a much greater load than ordinary direct-acting tramway engines—with the further gain of half the consumption in fuel.

Ticket to the Clouds

Tourists should shortly be able to take tickets at Charing Cross for the summit of Mont Blanc. The permanent way is now nearly half way to the top of Mont Blanc, and as soon as the rolling stock is purchased and stations are built the first portion will be opened for traffic.

ME, 18 July 1907

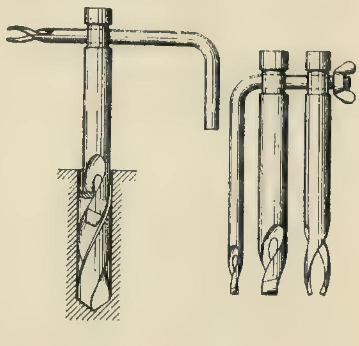
REMOVING BROKEN DRILL PIECES

ONE of the biggest headaches in drilling occurs when a drill breaks in the hole. A new invention by a German firm does much to relieve the tedium of grappling with such a disaster.

The tool is in the form of an extractor, the principle of which is clearly discernible in the sketch.

The extractors are made in a set of three sizes and the smaller extractors can be used as wrenches to provide the turning torque to operate the tool.

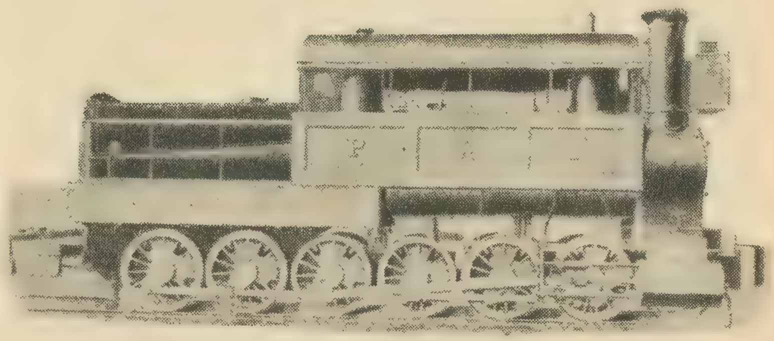
If the prongs are unsuited to the form of the broken drill they can be modified by grinding. ▣



UNUSUAL LOCOS . . . . How about these prototypes of the 1860s?

By ERNEST F. CARTER

IN the search for a design for a locomotive of heavy weight to operate over permanent way of insufficient strength yet have sufficient flexibility to negotiate curves of small radius, many unusual ideas for articulation were put forward. Of them the Fink locomotive *Steierdorf* is a good example, though neither she nor her sisters *Gerliste* and *Krassova* gave satisfaction on the Austrian State Railways upon which they were used for a few years.



Philadelphia and Reading Railway 0-12-0*T locomotive* PENNSYLVANIA *of* 1867

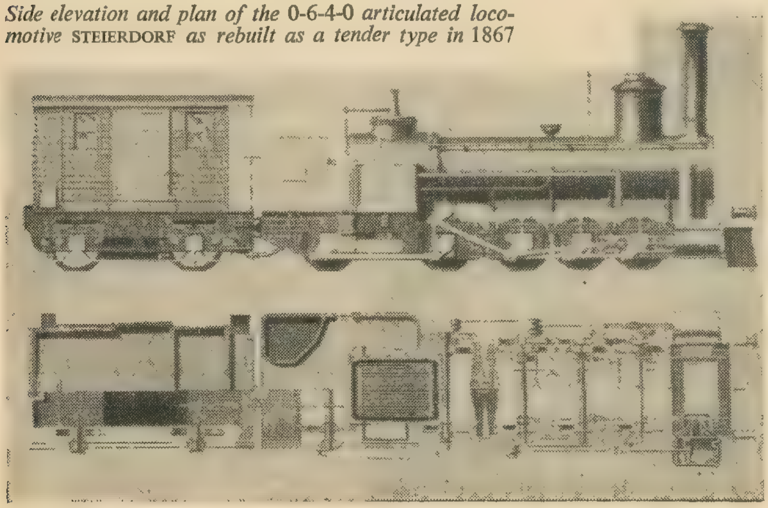
Of 0-6 + 4-0 wheel arrangement, *Steierdorf* was exhibited as a tank engine in London in 1862 and, as rebuilt with a tender, at the Paris Exhibition of 1867. At both these exhibitions she created a furore among locomotive engineers.

The engine had two sets of wheels with outside frames, both of which were articulated—and, in the 1867 tender version, the back of the firebox rested on a pseudo-tender by a cross member supported by a roller. The drive was transmitted from one power bogie to the other by a countershaft connected by coupling rods with each of the groups of wheels, the countershaft always remaining parallel to the axles of the leading group, but varying in position in reference to the axles of the trailing group. The countershaft connected by struts rested on the leading axle of the trailing group, the struts being free to oscillate around their lower ends.

When running on a straight road, these struts stood vertically, but on entering a curve they inclined in opposite directions, and the distance between the countershaft and the nearest axle of the rear group of wheels was increased if the inclination was forward, and decreased if the inclination was backward. The pressure between the rails and the wheel-flanges of the first axle of the rear group was sufficient to start these movements and to cause this axle to set itself radially to the curve.

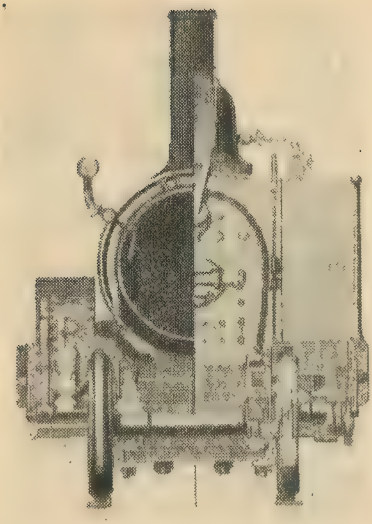
This movement was transmitted from this axle to the neighbouring axle of the leading group of wheels, because, in spite of all these movements, the coupling pins of the two groups remained parallel. The countershaft, parallel as it was to the axles of the leading group, descended in proportion to the sharpness of the curve being negotiated, and moved convergently in reference to the axles of the trailing wheel-group.

Side elevation and plan of the 0-6-4-0 *articulated locomotive* STEIERDORF *as rebuilt as a tender type in* 1867

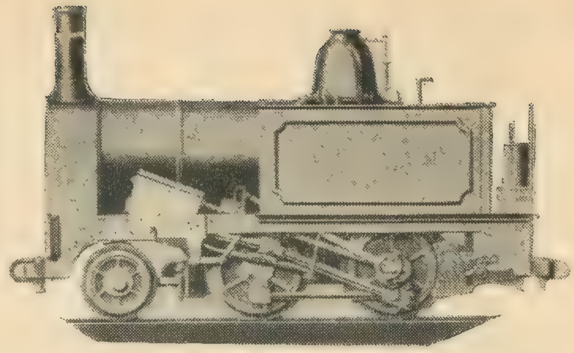


The design was very ingenious, but not geometrically accurate, because the various parts of the mechanism involved were not all in the same plane; M. Fink himself estimated that the error was in the region of 1 mm. The large cross-stresses brought to bear by such an error necessitated all the components being made of very large cross section, which added to the engine's weight.

Steierdorf and her sister engines had 18½ in. × 25 in. cylinders, steam being fed to them at 99 p.s.i. from a 4 ft dia. boiler 13 ft 10 in. in length containing 158 2 in. dia. tubes pitched at 2⅝ in. centres. The fire-box was 4 ft 3 in. in height and the grate area 14 sq. ft, the heating surface of the fire-box being 73 sq. ft, which, coupled with the 1,157 sq. ft provided by the boiler tubes, brought the total up to 1,230 sq. ft.



Left and right: Section of front end, elevation at rear end and side elevation of the 3 ft gauge tramway loco owned by the Rhymney Ironworks, South Wales. It was built in 1867



Driving wheels were 3 ft 2 in. dia., the wheel base of each truck being 7 ft; the total wheel base was 18 ft 7 in. The wheel-loading was as follows: Front pair 9 tons 4 cwt; second pair 9 tons 2 cwt; third pair 8 tons 15 cwt; fourth pair 6 tons 5 cwt and the fifth pair 9 tons 2 cwt—a total weight of 42 tons 8 cwt. Coal bunkers were provided which carried 1¾ tons of coal, and water tanks containing 1,100 gallons. On the rebuilt tender version, the tender weighed 10 tons 4 cwt and carried 194 cu. ft of water.

Another interesting locomotive of the period which also seemed to be "all wheels" was the *Pennsylvania*, a 12-coupled banking engine designed by James Millholland in 1867 for the Philadelphia and Reading Railway of America, and built at their Reading shops.

Specifically designed for banking heavy coal trains up the 1¼ miles of 1 in 155 grade on the outskirts of Philadelphia, *Pennsylvania* boasted two 20 in. × 26 in. cylinders and 3 ft 7 in. dia. wheels uniformly spaced at 3 ft 11 in. centres. Her overall wheel base was 19 ft 7 in., and the two pairs of wheels under the central part of the engine were flangeless.

The 4 ft dia. boiler contained 174 tubes, 2 in. dia., each 13 ft 6 in. long. The grate, which was designed to burn anthracite, was 9 ft × 3 ft 6 in., giving an area of 31½ sq. ft. A combustion chamber 2 ft 1 in. in length extended from the fire-box to the tubeplate, so that the total length of the boiler (excluding the smoke box) was 25 ft. The total heating surface was 1,428 sq. ft.

Three tanks were provided: one on each side of the footplate and one over the fire-box. Their total capacity was 1,000 gallons. No coal was carried, firing being done at each end of the 1¼-mile journey up and down the bank.

The steam ports to the cylinders were each 18¾ in. in length and 1⅝ in. in width, and the 18¾ in. × 3½ in. exhaust ports communicated with a blast nozzle, the area of which could be varied by the driver from 11 to 24 sq. in. in area.

Pennsylvania achieved a speed of over 10 m.p.h. up the bank, developing a tractive effort of 18,140 lb. with 75 p.s.i. effective steam pressure on her cylinders.

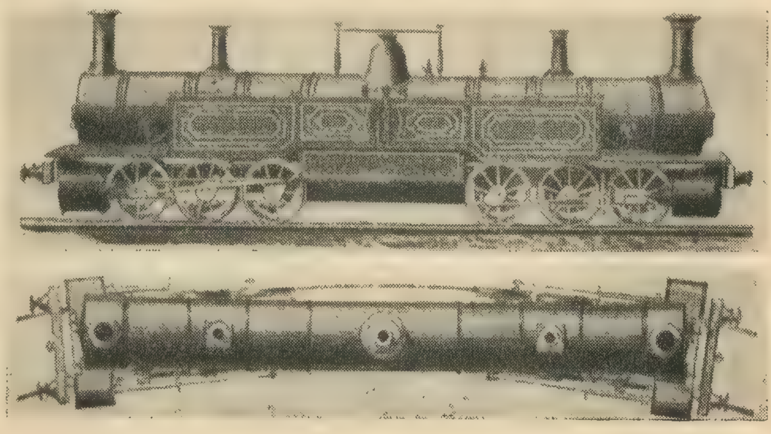
While such developments in locomotive engineering were going on in Austria and the United States, a queer little 2-4-0 tank locomotive with centrally-flanged wheels made its debut on the Rhymney Ironworks horse tramway in South Wales.

Nameless, this tough little giant would haul 35 tons up a 1 in 280 grade to the dizzy heights of the local slag-tip on a 3 ft gauge tramway designed for horse-traction upon which the traction resistance was no less than 60 lb. per ton! The plateway must have been in an execrable condition.

Designed by William Moyle, the chief engineer of the ironworks, the engine was built by the neighbouring Neath Abbey Ironworks in 1867. Her two cylinders were 8 in. bore × 16 in. stroke, and the driving wheels were 2 ft 8 in. in dia. set at 3 ft 6 in. centres. The wheels of the pony truck were 2 ft in dia. and the total wheel base of the engine 7 ft 1 in. The wheel tyres had a central flange, their treads bearing for a width of about 2 in. on the flat part of the tram rails.

The boiler contained 56 2⅛ in. dia. tubes, the fire-box heating surface being 19.7 sq. ft, and the grate area 5.32 sq. ft. A total of 163½ sq. ft of heating surface was thus provided at a working pressure of 60 p.s.i., which gave the engine a tractive effort of 1,920 lb.

A footplate-operated steam brake was provided with two 6 in. × 8 in. cylinders, as the driver had also to do all the coupling and uncoupling during shunting operations. The total weight of the engine was 9¾ tons, of which 8½ tons was on the driving wheels and 1¼ tons on the pony truck; the latter was fitted with two radius-bars and Bridges Adams type springs. ▣



A model of a double-boilered Fairlie engine built for the Queensland Railways. The engine was built in 1867 *and shown at the Paris Exhibition of that year (Side elevation and plan showing engine on a two-chain curve)*

ZOE

This week LBSC gives details of cylinders suitable for the $3\frac{1}{2}$ in. gauge version of the narrow gauge 2-8-2

Continued from 4 July 1957, pages 20 to 22

WHEN describing the cylinders for the $1\frac{3}{4}$ in. gauge *Zoe* I promised to give the variations for the double-size engine. They are of similar design to the smaller cylinders, but differ a little in detail. As the machining, fitting up and the erection are carried out in the same way as previously described, there is no need to go through the whole ritual again; I will merely call attention to the differences.

As already mentioned, the main frames for the $3\frac{1}{2}$ in. gauge engine are cut to double the dimensions specified for the smaller one, but there is a little difference in the screwholes and also in the openings for the hornblocks. I thought, therefore, it would make matters clear if I offered a drawing of the front end of the frames, showing the position of the cylinders. If the hornblocks and axle boxes specified for the 5 in. gauge *Netta* are used as recommended, the openings in the frame will be $2\frac{1}{8}$ in. × $1\frac{1}{2}$ in. and the centre line of motion will be $1\frac{1}{8}$ in. from the bottom of the frame.

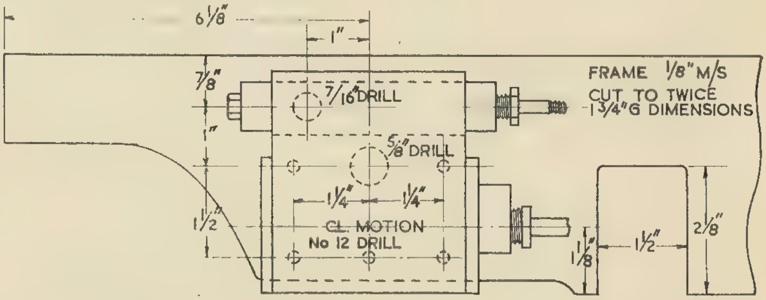
As to the screwholes and those for the steam and exhaust pipes, I have included the position of these in the location drawing. The vertical centre line of the cylinders is $6\frac{1}{8}$ in. from the front end of the frame.

At $1\frac{7}{8}$ in. from the top edge, drill a $\frac{5}{8}$ in. hole for the exhaust pipe. At 1 in. above this and 1 in. ahead of it, drill a $\frac{7}{16}$ in. hole for the steam pipe. The screwholes are drilled $\frac{3}{16}$ in. clearing, using a No 12 drill. The upper two are located at $1\frac{1}{4}$ in. each side of the exhaust hole and level with it. The three lower are drilled $1\frac{1}{2}$ in. below the upper two and the exhaust hole. All are shown in dotted lines in the drawing so there should be no mistake about their position—which is important.

The cylinder castings can be set up, bored and faced, and the port and bolting faces machined off exactly as described for the smaller castings, if a suitably-sized face plate and angle plate are available.

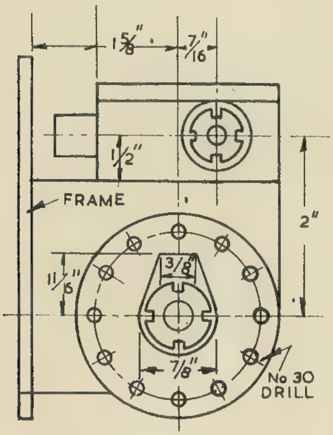
An alternative way of holding the castings for boring out and facing one flange would be to hold the casting in a big four-jaw chuck and to set the cored hole or marked circle (as the case may be) to run truly. On a small lathe it would be best to mount the cylinder casting on the saddle, with the cored hole or marked circle level with lathe centres, and bore out with a tool mounted in a boring bar between centres.

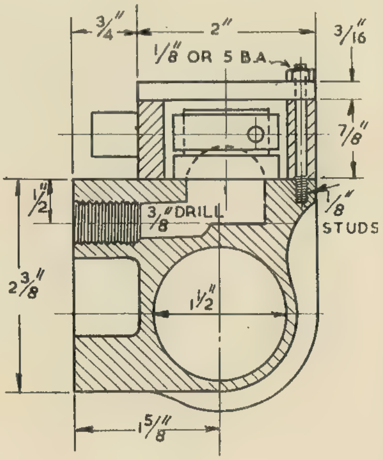
I don't imagine that many home workshops will boast a $1\frac{1}{2}$ in. parallel reamer, so it will be necessary to bore to finished size, taking the final two cuts without shifting the cross slide if boring with an ordinary tool, or without shifting the cutter in a boring bar.



Above: Location of cylinder

Below: Back view of r.h. cylinder and section through the exhaust port

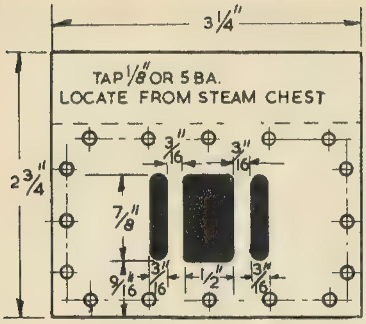


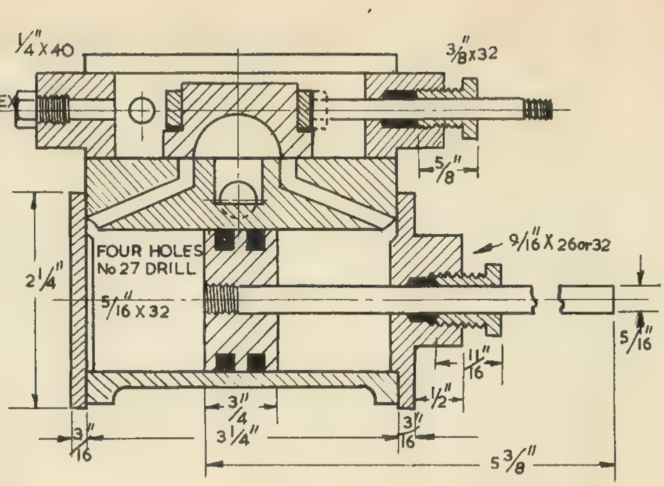


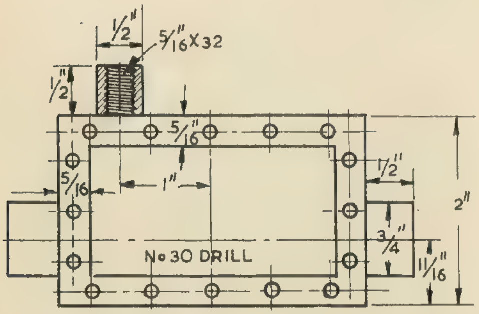
It only requires a comparatively small angle plate to set up the castings on end for machining off the portfaces and bolting-faces, so there should be no difficulty over those jobs. That goes for cutting the ports and drilling the steam and exhaust ways as well. Note that there are four holes at each end of the bore, the middle pair being separated a little to clear the top cover screw.

The covers are turned as previously described, but as the guide bar is not screwed into the gland boss on the back cover, a flat seating is needed. This can be end-milled by clamping the cover, boss upwards, under the slide rest toolholder and using a $\frac{1}{2}$ in. or larger end mill or slot drill in the chuck. The procedure is the same as when milling rebates in axle boxes.

When fitting the cover lay the cylinder, bolting-face down, on the lathe bed or some equally true surface, with the cover on it as true as you can set it by eye, then apply a try-square,







Top left: The portface; top right: Section of l.h. cylinder; left: The steam chest

stock to flat surface, and set the flat on the gland boss to the blade. This will set it exactly true, but take care that it doesn't shift while you are locating the screwholes in the cylinder flange through those in the cover.

Each piston has two grooves, $\frac{3}{16}$ in. wide and $\frac{3}{16}$ in. deep, to take a couple of "piston rings" made from $\frac{3}{16}$ in. square-braided graphited yarn. The ends of these are cut off at an angle, like metal piston rings, and when fitted to the pistons should be just too big to enter the bore without a little judicious prodding with a "persuader"; I use a watchmaker's screwdriver, which is just the tool for the job. The rings will then keep the piston quite steamtight without the least extra friction.

Beginners should always bear in mind that the more friction there is in the works of a little locomotive, the less power will be available at the draw-bar for pulling a load, which is the engine's purpose in life.

STEAM CHESTS AND COVERS

While the steam chests are of the same type as those on the smaller engine, the diameter of the bosses at either end is such that the top and bottom contact faces of the chests can be machined off by chucking them as centrally as possible in the four-jaw and facing off each side with a round-nose tool set crosswise in the rest. The bosses themselves can be served with a dose of the same medicine prescribed for the 1$\frac{3}{4}$ in. size.

The cover can be cast—in which case it should have a chucking-piece cast on in the middle to be held in the chuck while truing up the underside to fit on the steam chest. There is no need to face the upper surface, which is hidden under the running board when the cylinders are erected.

Alternatively, it can be made from a piece of $\frac{3}{16}$ in. brass plate measuring 3$\frac{1}{4}$ in. × 2 in., which should be trued up on the contact side by rubbing it on a piece of fine emerycloth or similar abrasive and laid with the working side up on something flat, such as the drilling-machine table. Holes in both the cover and portface are located as described for the small cylinders.

Studs are used instead of screws. These are made from $\frac{1}{8}$ in. round steel —either mild or silver steel will do— and are a full 1$\frac{1}{2}$ in. long, with $\frac{1}{4}$ in. of $\frac{1}{8}$ in. or 5 BA thread on each end. They are fitted as shown in the section through the exhaust port.

SLIDE VALVE AND BUCKLE

Were I building a 3$\frac{1}{2}$ in. gauge *Zoe* I should fit piston valves; but for reasons of their own some locomotive-builders fight shy of them and prefer slide valves. I am, therefore, specifying this type for the larger engine, but have adopted the pattern used in full-size practice.

The valve is large and fairly deep, and has a dome-shaped exhaust cavity which ensures that the exhaust steam has a free passage to the blast pipe. The valve is driven by a buckle into which the inner end of the valve spindle is screwed. The valve should be free to move up and down in the buckle, but should have no end-play, which would affect the valve setting.

As the dimensions are the same as those on the 5 in. gauge *Netta*, and castings are already available for these, the use of a casting is recommended, for it saves the trouble of cutting out the cavity. Failing a casting, the easiest way to make the valve would be to build it up in two sections.

The lower one would need a block of gunmetal or bronze $\frac{1}{4}$ in. thick, measuring 1$\frac{1}{2}$ in. × 1$\frac{3}{16}$ in. Mark out the cavity on this, and cut out the hole by drilling and filing, but *don't* cut the sides of the hole parallel; file them on a bevel so that the opening on the unmarked side of the block will be smaller than that on the working face.

On the side with the smaller hole, silver solder a block of similar metal, measuring 1$\frac{3}{16}$ in. × $\frac{15}{16}$ in. and $\frac{1}{2}$ in. thick. This should completely cover the hole. Be sparing with the silver solder, and the valve will be equal to a cast one. The valves, whether cast or built-up, should be very carefully trued up on a piece of fine emerycloth as mentioned for the steam-chest cover.

Now another tip for beginners: as long as the face is dead true you do *not* need a polished surface. In the past, builders of steam engines of all kinds have been instructed to use metal polish and various other "finishers" to obtain a polished

ZOE continued . . .

surface. My own experience is that this is a great error.

The minute scratches over the face of a valve trued up on fine emery-cloth, carborundum and aloxite cloth and similar abrasives, hold a film of oil when the engine is at work, and this not only forms a perfect steam-tight seal, but enables the valve to slip back and forth over the ports with the least possible friction, with consequent long life of the valve gear.

Tales of how steam pressure on the back of a large valve causès the rubbing surfaces to wear—so often put about by the advocates of small ports, little valves and so on—are well and truly neutralised if there is a permanent film of oil between valve and portface, which prevents metal-to-metal contact.

My old stager *Ayesha* has had one new pair of valves in 36 years, and I don't think she would have needed them if *a* she had been fitted with a mechanical lubricator when first built and *b* the original valves had been made from good quality bronze instead of brass. The proof of the pudding is always in the eating !

The buckle for driving the valve can also be a casting—in which case it will have the boss cast on—and will only need cleaning up with a file to fit nicely on the back of the valve, and the boss drilled and tapped for the valve spindle. The latter is a piece of $\frac{3}{16}$ in. rustless steel or drawn bronze rod, a full $2\frac{5}{8}$ in. long, with a $\frac{1}{4}$ in. of $\frac{3}{16}$ in. × 40 thread on each end. The threads must be tight, so that there is no chance of the spindle's coming loose in the boss when the engine is running at a good clip.

The cylinders are assembled and erected in the same way as described for the smaller set. Commercial screws of the pitch specified—$\frac{3}{16}$ in. × 40 are not available—so they will have to be home-made, but this is only a child's practice job. Just chuck a piece of $\frac{5}{16}$ in. hexagon steel (commercial article) in the three-jaw, face the end, turn down $\frac{1}{2}$ in. length to $\frac{3}{16}$ in. dia. and screw $\frac{3}{16}$ in. × 40 with a die in the tail-stock holder. Part off to leave a head 5/32 in. thick, reverse in the chuck and chamfer the corners of the hexagon.

Round steel could be used, and the heads slotted with a saw to take a screwdriver, but hexagon heads are handier to tighten up between frames.

STUDDED *v.* SCREWED GLANDS

A correspondent recently called me over the coals because I nearly always specify screwed glands, saying that they are never used on full-size locomotives. I might get my own back by saying: "Oh, yes, they are," and citing the glands on the Westinghouse donkey pumps on the LB and SCR engines, which were all screwed.

However, my experience is that wee studded glands on little locomotives are, to speak plainly, just a darned nuisance, and I wouldn't use them where I can get a screwed one in. Studded glands are tricky to adjust in small size to avoid binding, and tiny nuts are prone to work loose when the engine is running fast, unless lock-nuts are fitted. I know from personal experience what a tantalising and exasperating job it is to adjust 3/32 in. lock-nuts on the glands of a $3\frac{1}{2}$ in. gauge engine with inside cylinders.

I freely admit that they look very nice, but the locomotives described in these notes and the locomotives that I actually build, are primarily designed for real work; that is why I prefer screwed glands. These are easy to make, fit up, and adjust, and if the threads are a reasonably tight fit, as they should be, they will not slack off under ordinary working conditions.

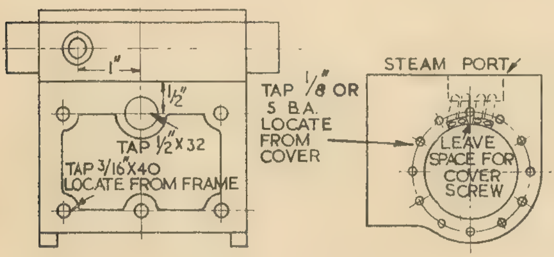
There are, of course, exceptions to every rule, and in the case of a large pump on a stay between the frames, a studded gland might be more convenient to fit than a screwed one. A case in point is provided by a design in which I specified the pump barrel to be silver soldered to the cross stay, fitting a square-headed gland to it by four studs screwed into the cross stay. This proved quite satisfactory, as the gland could not get out of line with four studs to guide it, and the nuts were quite accessible.

Speaking of pumps, another querist says that the crosshead pump fitted to his engine, which is built to my instructions, works perfectly at low speeds, but as soon as the engine runs fast, the pump jibs and won't keep up the water level. He thinks that a long-stroke pump is not suitable for fast running.

Well, it is ! His trouble is soon located. If he makes the nicks above the suction valve a little larger, the trouble will disappear, and the pump will feed at any speed. When the engine runs slowly, the valve ball only just lifts off its seating and the ram draws a full charge of water on its outstroke. But when running fast, the valve ball is sucked up tightly against the end of the hole through the valve box, and if the nicks are not large enough to let sufficient water pass the ball to fill the pump barrel, there will be very little for the ram to force into the boiler on the return stroke.

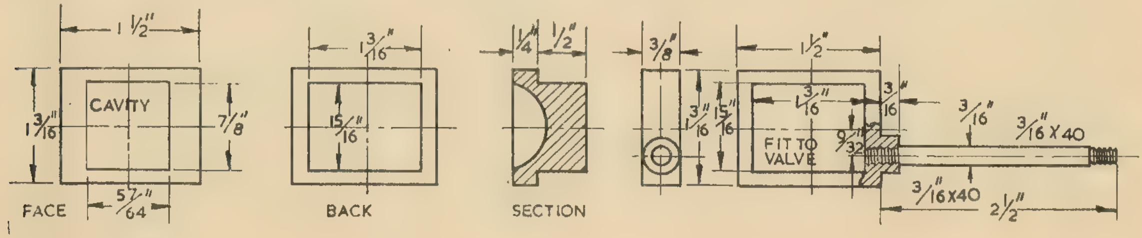
This state of affairs is usually betrayed by the pump making a hammering and clacking noise.

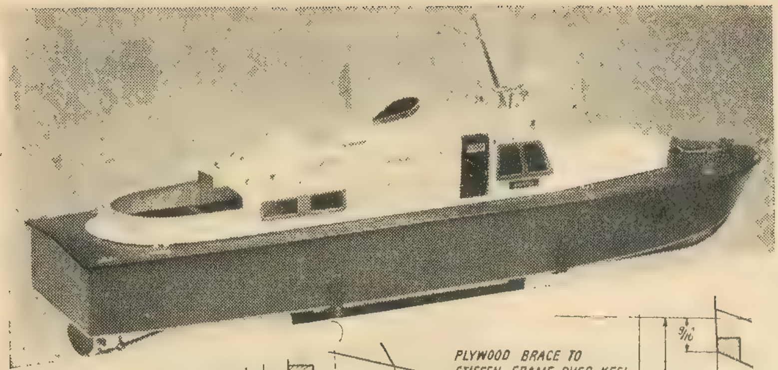
● *To be continued*



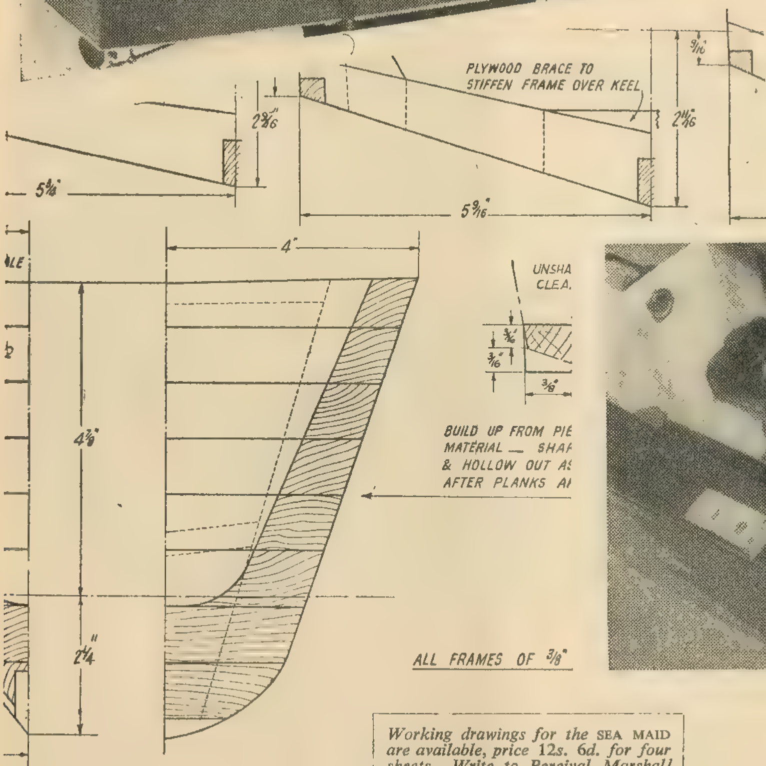
Left: Bolting face of r.h. cylinder and the method for drilling the passages

Below: Slide valve, buckle and spindle





Models from the ME PLANS SERVICE



Working drawings for the SEA MAID *are available, price 12s. 6d. for four sheets. Write to Percival Marshall Plans Service, 19-20 Noel Street, London, W1, quoting PB 6*

THE SEA MAID HARD CHINE CRUISER PB 6

NEARLY all the popular types of power driven prototype ships and boats are represented in the ME Plans Catalogue, including naval craft, coastal vessels, tugs, trawlers and cabin cruisers. All tastes and preferences are thus catered for, but for the beginner who has no decided views on the type of craft on which to make a start it is a good policy to select a form of hull which is simple and straightforward in construction, yet shapely and efficient in performance and suitable for fitting various kinds of power plant.

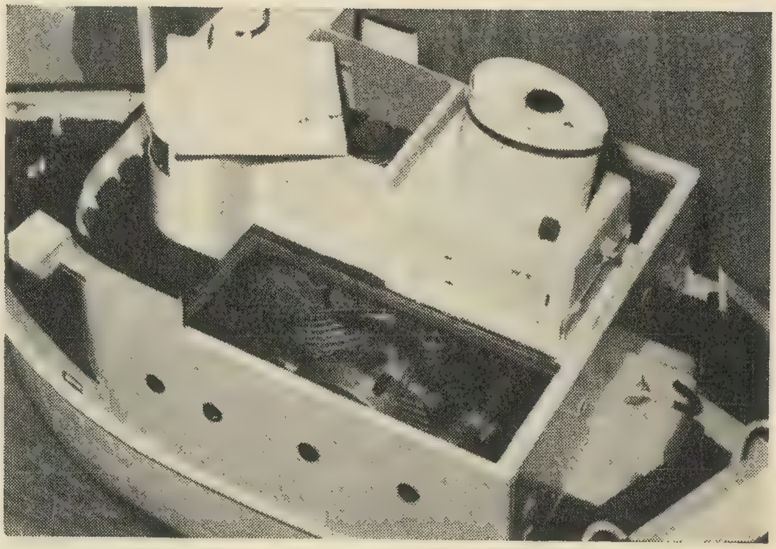
In this respect, the hard chine cruiser *Sea Maid* can confidently be recommended. It is a modern design by A. D. Trollope well suited to stand up to running conditions and realistic in appearance when in action.

The example illustrated is fitted with a Seal 15 c.c. engine and won a high award at the 1954 Model Engineer Exhibition.

The hull dimensions are: length 48 in., beam 12 in. It is possible to make modifications to the upper works and deck fittings if desired. The buoyancy is ample to carry a powerful internal combustion or steam plant, together with radio control equipment. An instruction leaflet is included in the set of plans which comprises four sheets, namely: (1) hull lines, half size; (2) hull sections (aft) full size; (3) hull sections (forward) full size; and (4) suggestions for superstructure, half size. ▣

All set for a trial [*Western Times*]

A MODEL TUG POWERED BY A CYCLE ENGINE



Close-up of the model, with a view of the four-stroke engine power plant [*Eric G. Castle*]

Yes, a cast-aside four stroke was adapted for this model's power plant. That it was successful can be gauged from the fact that the tug happily towed a 14 ft rowing boat with two people aboard. It is described by H. M. A. FORTH

FOR a long time I had considered the idea of building a model tug that could tow a rowing boat. Then one day in July 1955 I was left with a push-bike engine that would not sell at a fair price, and I decided that it would be the ideal power unit for my model tug.

The main keel was made from pine, which worked very well, and then I added the main frames—eight of them. Over these I fixed a skin of 3/64 in. marine ply, which took longer than I thought because it did not take readily to the odd curves into which I bent it; but I won in the end.

This ply skin was laid in 2 in. planks running from bow to stern and stepped from keel to deck level.

By now I had a strong hull, but it was far from finished: I had to cover the ply with $\frac{1}{8}$ in. balsa wood sheets, which were cut to follow the contours of the hull so having very little waste.

When the balsa skin was in position and sanded it was ready to receive the glass fibre covering. It took about an hour and a half to attach the glass fibre.

I let it set hard for two days, then I tested it in a bath of water and all I found were two very tiny leaks which were soon plugged.

When these were watertight I loaded it to the water line to see what weight it could carry. The " plimsoll " line, I decided, should be 3 in. below deck level. It took 98 lb. to load the hull to the plimsoll line, and another 28 lb. to lower it to within 2 in. of the deck level.

I was not too happy with these figures as the engine and gearbox only weighed 36 lb., so I used 27 lb. ballast.

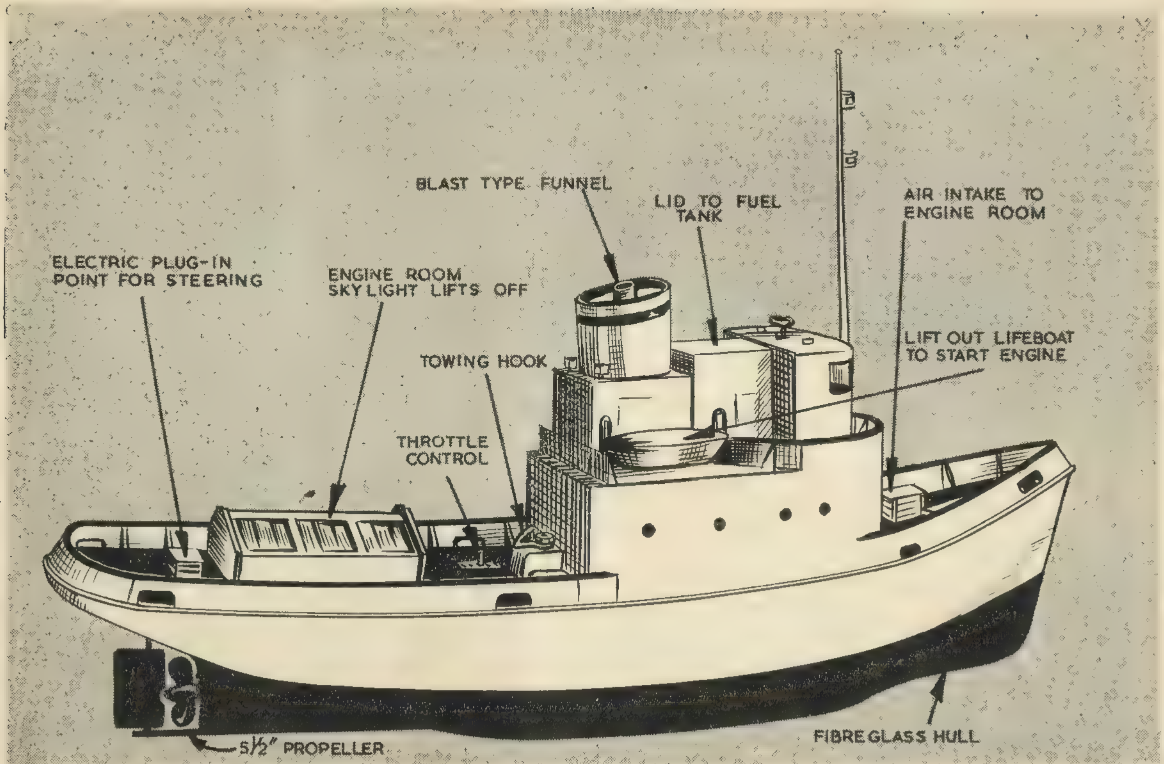
The engine is a 48 c.c. o.h.v. and its output at 3,000 r.p.m. is just over 1 h.p. The final drive was too low, for it was fitted with a 14 t. wheel, so I put a 38 t. cycle sprocket on. The only other addition I made to the engine was to fit a starting handle.

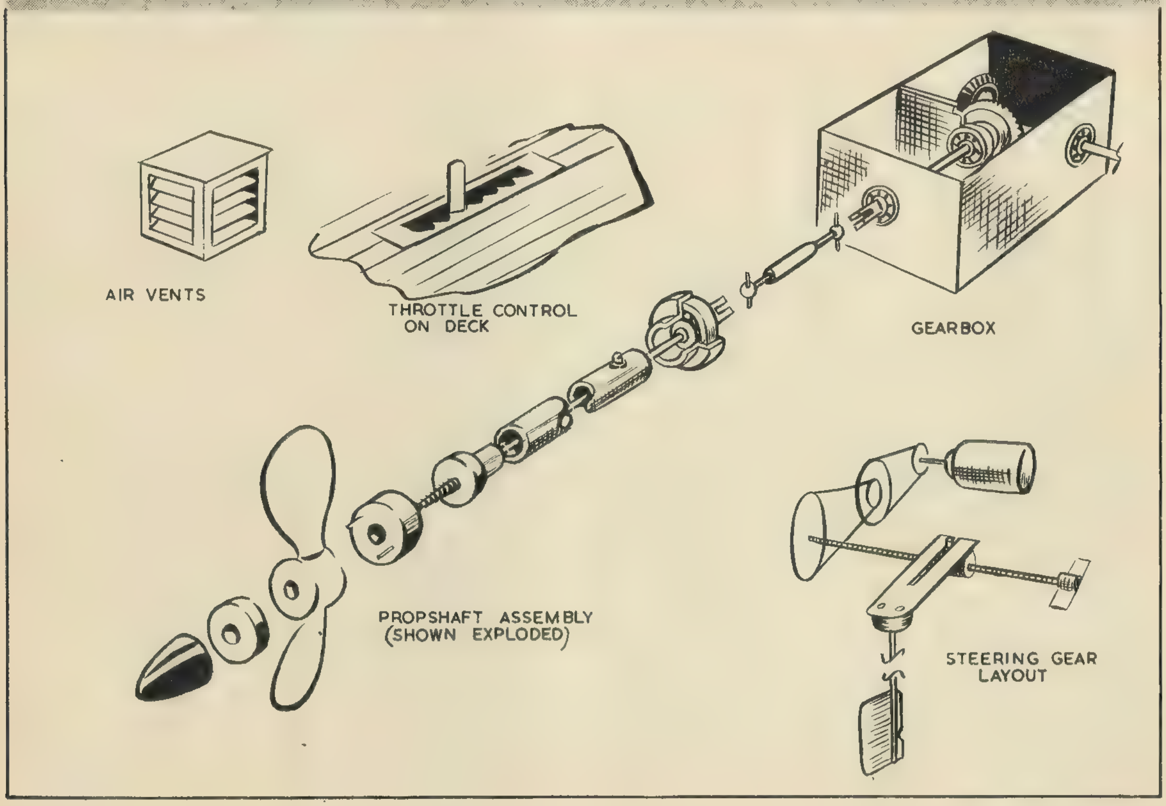
The gearbox I made myself from steel supplied by a firm in Exeter. The gears are two 2 in. steel bevels on $\frac{1}{2}$ in. steel shafts and the $1\frac{1}{2}$ in. ball races run on $\frac{1}{2}$ in. centres. The power input is taken from a 7 t. sprocket.

One copper tube about 12 in. long forms the outer casing for the propeller shaft, the drive being taken on a $\frac{1}{4}$ in. steel shaft supported on a 1 in. ball race at the top end and a 1 in. × 1 in. brass bush at the stern.

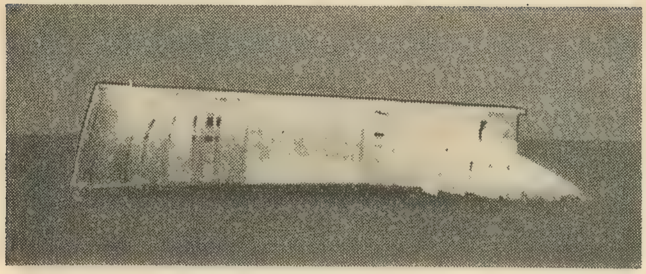
The propeller is held to the driving shaft by a brass bush silver soldered on, and the whole lot was held together with two locking nuts.

Brass of 1 in. section formed the basis of the first propeller, which had three blades of $\frac{1}{16}$ in. brass sheet, but I found on a test run that it would not stand up to the power output so I made another one in steel. This had only two blades, a little on the large side, fashioned from $\frac{1}{8}$ in. steel plate which showed no signs of distortion under load. The steel propeller was $5\frac{1}{2}$ in. dia.—$\frac{1}{2}$ in. bigger than the brass one.


BLAST TYPE FUNNEL
LID TO FUEL TANK
AIR INTAKE TO ENGINE ROOM
ELECTRIC PLUG-IN POINT FOR STEERING
ENGINE ROOM SKYLIGHT LIFTS OFF
TOWING HOOK
LIFT OUT LIFEBOAT TO START ENGINE
THROTTLE CONTROL
5½" PROPELLER
FIBREGLASS HULL


AIR VENTS
THROTTLE CONTROL ON DECK
GEARBOX
PROPSHAFT ASSEMBLY (SHOWN EXPLODED)
STEERING GEAR LAYOUT

A MODEL TUG . . .



Above, on the stocks and, right, nearly ready for the launch !

The steering is operated by an electric motor geared down to 150 to 1. This gives a turning torque to the rudder of about 7 lb., sufficient for all the sailing conditions I am likely to meet.

The rudder is operated by a long cable, power being supplied to the electric motor from the rowing boat which holds the battery and control switch.

The mechanism for turning the rudder comprises a long screw rod upon which runs a nut with a connecting bolt to the tiller. When the rod is rotated by a sprocket connected to the motor, the nut travels to port or starboard, swinging the rudder in the opposite direction.

On hatch No 2 is fixed the electric fan for cooling the engine, and on the foredeck are four bollards, one winch and two beehive air intakes. There is also a towing hook made from $\frac{3}{16}$ in. steel rod with a $\frac{1}{2}$ in. bolt for the swivel point. The bolt is 3 in. long and penetrates the deck where there is a locking nut to hold it securely.

The engine room skylight lifts off in one piece. It is normally held in position by six bollard-type nuts. Immediately behind the skylight is the plug-in point for the steering gear motor.

The last hatch is for servicing the rudder, and in this same hatch is a chain to hold the towline straight in a choppy sea.

Inside the wheelhouse there is a tank which holds $\frac{1}{4}$ gal. of fuel. The rear part of the wheelhouse roof can be lifted off for re-fuelling purposes, and it is also possible to remove the tank through this opening.

Exhaust gases from the engine pass through the funnel, drawing hot air from the engine room and thus helping to keep the engine-room temperature down.

From the keel to the water line the tug is painted black, and from that line upwards it is grey. The superstructure is grey with black fittings, and the funnel is also grey, decorated with a red band.

Sea trials proved very successful. The tug towed a 14 ft rowing boat with two on board—despite a rough sea with head wind and adverse current—at three to four knots. ■

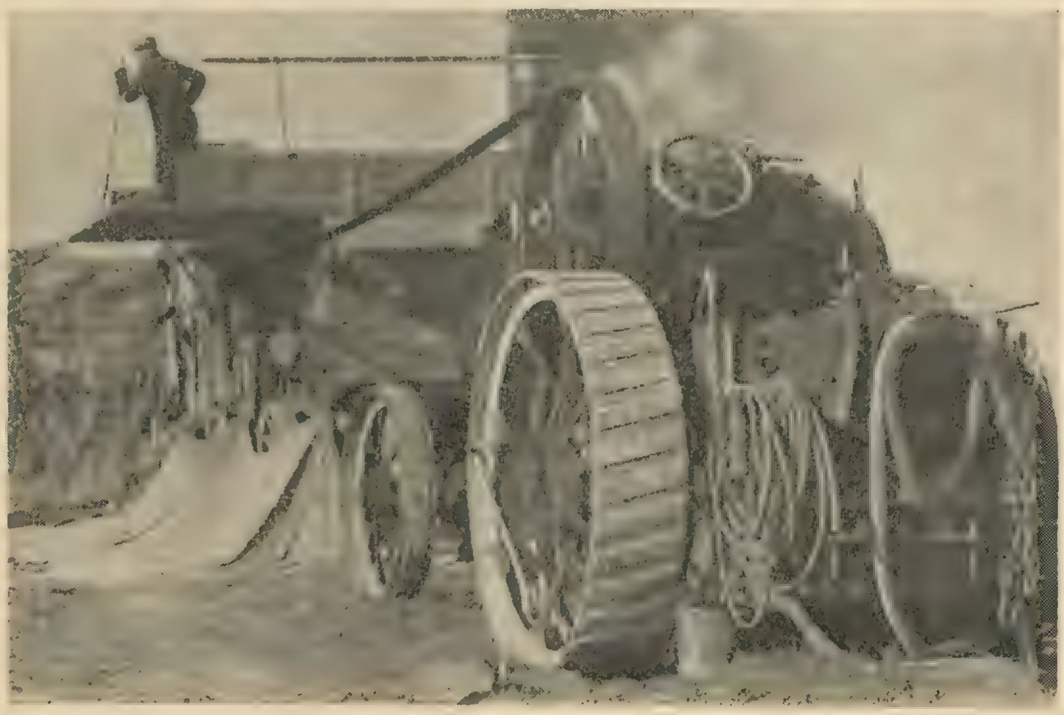
Home—after a successful preliminary [*Western Times*]

MODEL ENGINEER INDEX READY

The index for Volume 116 of MODEL ENGINEER (January-June 1957) is now ready. It is obtainable from the Sales Department, Percival Marshall and Co. Ltd, 19-20 Noel Street, London, W1, price 1s., post paid. Included with the index is the title page.

STEAM ENGINE on the farm

Still at work . . . this engine, an eight h.p. Clayton and Shuttleworth, was built nearly fifty years ago! It is owned by a farming company and operates in South Lincolnshire. Pictures by J. H. Rawlinson



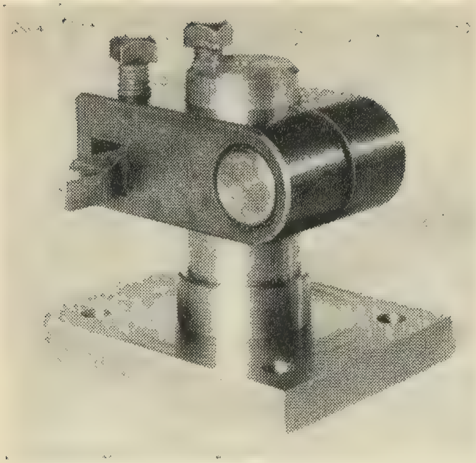


Fig. 8: The finished tool post with the Norman toolholder in place

CROSS-SLIDE TOOL POSTS

DUPLEX introduces a lathe attachment for maintaining effective tool rigidity

THE attachment illustrated in Fig. 8 was made for mounting on the cross slide to carry the Norman toolholder that is part of the standard equipment of the Drummond and Myford-Drummond lathes.

By this means the lathe tool is afforded a rigid mounting for heavy turning operations and its height can be readily adjusted; in addition, working is less encumbered after removal of the lathe top slide.

Although the pillar of the attachment could be secured to the cross slide by means of a single, long, central bolt, it is usually better engineering practice to mount a pillar with a small base on a separate base plate that is in turn held in place with four widely-spaced T-bolts. In this way the clamping pressure is evenly distributed over a large area and there is no need to tighten the bolts excessively in order to ensure positive location and freedom from tipping under the pressure exerted by the turning tool.

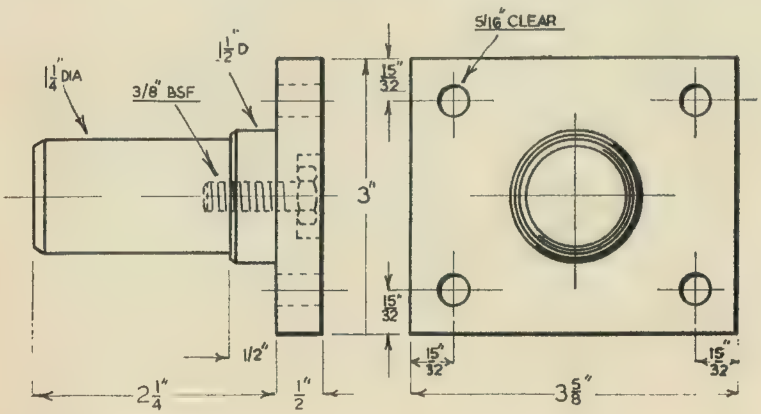
Nevertheless, the hexagon-headed screw securing the pillar to the base must be forcibly tightened and, for this purpose, a box spanner is used to enable the maximum tightening pressure to be applied by means of a stout tommy bar long enough to afford a hand grip at a radius of some 6 in. However, this represents a much greater turning moment than would be applied to a single, long bolt engaged in one of the cross-slide T-slots, but to withstand this treatment both the male and female screw threads should be made an accurate and close fit.

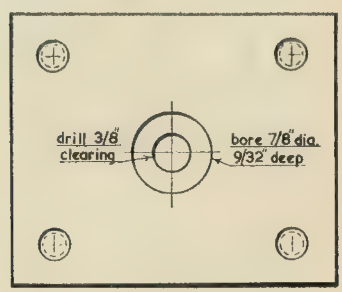
Although it is the common practice to allow screw threads a 75 per cent depth of engagement, in the present instance a letter O drill is preferable for forming the tapping hole so as to give a depth of thread engagement equal to 92 per cent.

CONSTRUCTION

The base plate is made from a piece of ½ in. mild-steel plate large enough to span the lathe T-slots and afford a hold for the four corner bolts. The surfacing work can be done in the shaping machine; but for machining the recess for the bolt head the plate will have to be mounted on the lathe face plate and, while in this position, the material might as well be machined on the under surface and afterwards turned over for facing the other side.

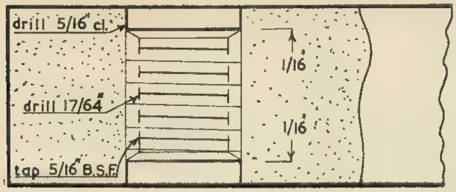
As a means of securing the work to the lathe face plate advantage can be taken of the four corner bolt holes and, to obtain a flush mounting, these holes are prepared in the way shown in Fig. 11. After the holes have been marked out and centre-drilled, they are drilled right through with a



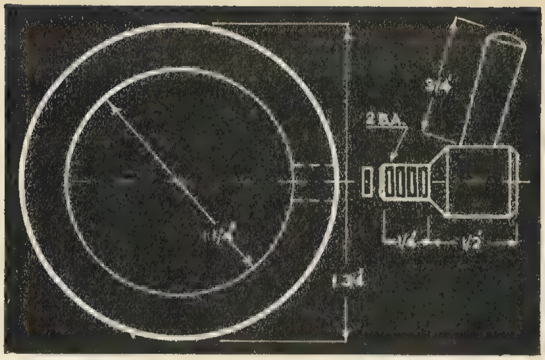


Above, Fig. 10: The base plate seen from below

Left, Fig. 9: Dimensions of the tool post pillar and base plate



Above, Fig. 11: Sectional view of one of the four base-plate screw holes



Right, Fig. 14: Details of the ring clamp

pilot drill of, say, $\frac{1}{8}$ in. dia. Next the holes are enlarged to the tapping size with a 17/64 in. drill to give the thread a depth of engagement of 80 per cent.

Before the holes are tapped their two ends should be enlarged to the clearing size for a depth of $\frac{1}{16}$ in. with a letter O drill.

The latter operation is necessary to prevent the tap from raising burrs at both the point of entry and emergence and also to enable the holes to be enlarged concentrically to the clearing size after the threaded portion has served its purpose of providing a hold for the screws used to secure the work to the lathe face plate.

In the workshop a discarded drilling machine has been converted into a motor-driven tapping machine furnished with a forward and reverse gear. It has been found that holes tapped in this way, especially those drilled in thin material, usually have more accurate and more closely fitting threads than those tapped by hand; for in the latter case correction of the axial alignment of the tap often results in forming a bell-mouthed hole with thin threads at the entry.

When marking out the work, the hole centre for the central screw is located and centre-drilled so that after the material has been mounted on the face plate this centre can be set to run truly by means of a centre finder or wobbler supported by the tail-stock.

Where a centre finder of this kind is used, the anvil of the test indicator should be applied to the spindle close to the surface of the work held in the chuck jaws. To indicate the diameter of the recess to accommodate the head of the fixing screw a circle is scribed with the dividers when marking out the hole centre.

After the work has been centred on the face plate and the service screws securely tightened, the clearance hole for the central screw is drilled from the tail-stock and the recess is machined with a small boring tool to allow a $\frac{5}{16}$ in. Whit. nut-size box spanner to enter. A right-hand knife tool is next mounted in line with the lathe axis and fed outwards to take a light truing cut over the base.

After removing the work from the lathe the machined side is checked for flatness on the surface plate, either by using a thin smear of marking paste or by giving the work a single rub on the plate and examining the distribution of the bright rub marks that indicate the areas of contact. If the lathe is in good order, the work surface may be hollowed towards the centre to a depth of, perhaps, $\frac{1}{2}$ thou.

This is quite usual, for an allowance has to be made for wear; otherwise, in time, the lathe might face work slightly convex and parts machined in this way would not mate correctly. Precision lathes, on the other hand, machine work almost dead flat, and it has been found that components surfaced in a lathe of this type have a tendency to adhere when wrung together. To finish the base plate it is reversed on the face plate and the upper surface is faced flat.

THE PILLAR

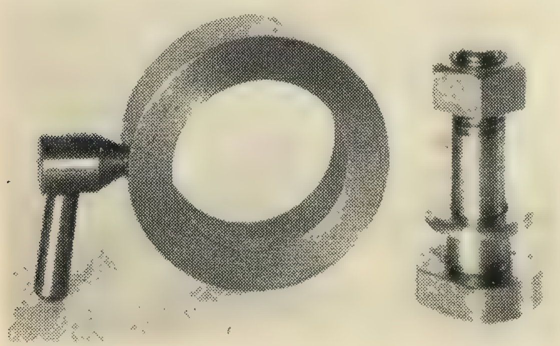
This part is at first machined slightly over the finished size and is then reversed in the chuck for drilling and tapping the axial screw hole and facing the abutment surface. If the pillar is finished by removing the high spots with a lap, the Norman toolholder can be made a close sliding fit so that it does not lose height when the clamping nut is slackened to align the tool with the work.

With the pillar gripped in the vice and protected by copper clams, the $\frac{3}{8}$ in. BSF hexagon screw is smeared with oil before being forcibly tightened to secure the base plate permanently in place. The T-bolt illustrated is of the correct size for attaching the tool post to the cross slide of the Drummond lathe.

Should there be any tendency for the toolholder to slide down the pillar when setting the tool, this can be overcome by fitting the small clamp collar shown in Fig. 13.

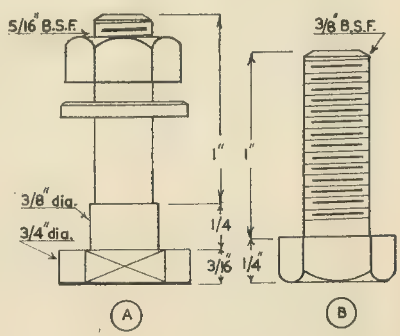
The collar is machined from an offcut from a $1\frac{3}{4}$ in. dia. bar to slide on the pillar, where it is locked in place by a finger screw which presses on a brass pad-piece to avoid damaging the clamping surface.

● *To be concluded*



Left, Fig. 13: The pillar ring clamp and a base plate T-bolt

Right, Fig. 12: One of the T-bolts and the pillar fixing screw



POSTBAG

The Editor welcomes letters for these columns, but they must be brief. Photographs are invited which illustrate points of interest raised by the writer

TRACTION ENGINES

SIR,—I was interested to read that Mr Clark " fully explains " in his book my remarks about Burrell engines in my letter published on May 23. I had not realised that any explanation was necessary, as what I stated was not drawn from any book but from a life-long acquaintance with the engines themselves, and I think I expressed myself fairly clearly.

What I did ask for was an explanation of the Aveling back axle shown in Mr Page's article, as there appeared to be no provision for a compensated drive and I could not see how one could be provided with the arrangement shown; but this has so far brought no reply.

With regard to the Foden rear axle springing, a very good reproduction of the maker's drawing of this was given in MODEL ENGINEER for 18 May 1933 in the very excellent series of articles then appearing by the late Henry Greenly, while a similar illustration can be found in Fletcher's book of 1890.

I merely mentioned the position of the springs as a corollary to Mr Page's remarks which might be interesting to any readers not familiar with these engines.

Norwich. GEOFFREY K. KING.

ATOMIC ENERGY

SIR,—In Smoke Rings of April 18, Vulcan refers to the possibilities for the model engineer opened up by the atomic age.

It may interest you to refer to an article, " The Utilisation of Our Natural Sources of Energy," appearing on pages 206 to 210 of MODEL ENGINEER of 28 August 1913. At the end of it the writer, G. Goss Carter, B.Sc., A.C.G.I., forecasts the use of atomic energy for peaceful purposes even at that early date.

The copy of ME referred to was given to me recently with several others of about the same date and has been a great source of interest to me during a recent spell in bed due to illness.

C. G. ROBERTS.

TWO POINTS

SIR,—Perhaps the following will help AEW, of Bromley, Kent, who contemplates making a model of the 18-pounder gun.

There were two rather prominent points which spoilt an otherwise excellent model recently described in the ME: (1) there is a distinct flare out to larger dia. at muzzle of piece, and there is a polished steel finish as on the breech; (2) the guide ribs are not one flat surface on the top of the barrel; curvature of barrel is visible between them.

Devizes, Wilts. A. G. MYLWARD.

MODEL PLOUGH

SIR,—My photograph shows a model of a horse plough of the type in general use on the Sussex Downs up till the end of the last century.

They were made entirely by the local wheelwright and blacksmith. The design was known as turnrise or one-way.

At the end of each furrow the half-round piece of steel, the rise, was changed over, also the cranked shaped piece of wood on top of the beam was reversed to throw the knife coulter over towards the unploughed land. The coulter was a loose fit in a mortised hole in the beam.

The operator then carried the tail around and the plough returned in the same furrow.

The outfit was powered by three horses in tandem, controlled mostly by words of command plus a long whip and a boy. Total wages: £1 per week.

I have forgotten the words of command which signified to the horses whether they were to turn or incline to port or starboard !

The model is 8 in. but I have another thrice that size in which the proportions are better.

By a coincidence, while I was writing this letter the BBC broadcast a description of a robot plough controlled by radar exhibited at the Bath and West Agricultural Show.

Welwyn Garden City, Herts. ARTHUR FORD.

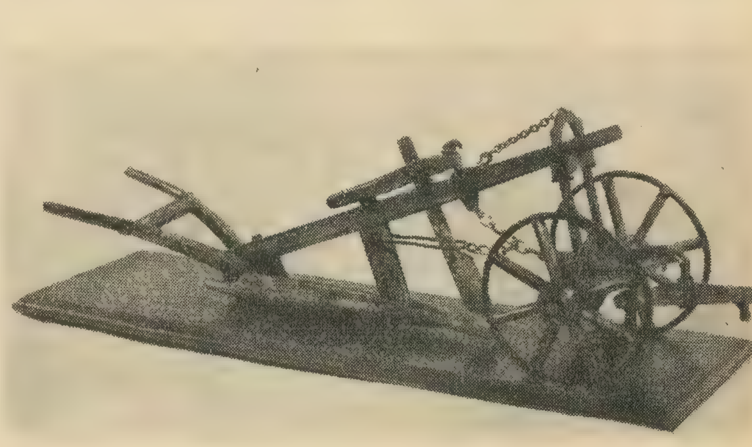
MODEL PROPELLERS

SIR,—In the recent article on the speedboat competition [ME, June 6] it was stated in connection with propeller design that the surface propeller has no greater slip than the submerged type.

In support of this, figures were quoted for the slip of a propeller which I have been using on my B class hydroplane *Nipper* 2 for about two years. These indicate that slip may be as low as 22 per cent in smooth water but increase under rough water conditions due to the propeller frequently coming out of the water.

I have recently carried out similar observations on a propeller of different design. The pitch was 9 in. and the blade area 0.8 sq. in. The values for the original propeller were 6¼ in. and 0.9 sq. in. respectively. The blades of the new propeller, however, have a more pronounced sweep-back.

Under smooth water conditions *Nipper* 2 has achieved speeds in



Model of a one-way plough once common on the Sussex Downs

The SOUTHERN CROSS *about which Mr Lench writes*

excess of 60 m.p.h. with engine speeds around 13,000 r.p.m. giving a calculated slip of 46 per cent. For comparison, the value for slip of the original propeller tested under identical conditions a few minutes earlier was 21 per cent.

This figure of 46 per cent is clearly much higher than that usually quoted for a submerged type of propeller.

Since the two propellers give the boat a similar performance, it seems doubtful whether the efficiency of the surface propeller is a vital factor in the performance of a hydroplane, provided the propeller remains in the water.

In the absence of more information, however, caution is necessary in drawing any general conclusions in this respect, for the efficiency of a surface propeller may well depend on other factors, such as the depth of immersion in the water, and this in turn will no doubt depend on the design of the hull. Thus, other things being equal, the same propeller may not give identical results in two hulls of different design.

I should be very glad to hear from anyone who can supply me with data of this kind relating to full-size hydroplanes.

Sydenham, London, SE26. M. de B. DALY.

SINGLE-ENGINE PLOUGHING

SIR,—In answer to George W. Eves, regarding the "Tommy Dodd" ploughing system, I cannot give any details of a single-engine ploughing set down at Rye, but there was a farmer at Ufton, near Leamington Spa, Warks, who used a Barford and Perkins set of the anchor-type ploughing system until about 1927.

This consisted of an 8 h.p. single-cylinder portable engine, a double drum truck, with drums holding 1,000 yd of $\frac{1}{2}$ in. rope, and driven from the engine by sprockets and chain. This set had two travelling anchors.

I have known the farmer plough four fields without moving the engine or drums.

The travelling anchors were of a different type to the ones described by Mr Eves, having a revolving shaft at the back, which was fitted with big anchor tines and held from revolving by a pawl and ratchet wheel.

A large steel ball fitted on to the rope just in front of the plough, struck a fork by the anchor's pulley wheel and lifted the pawl, allowing the anchor to run forward enough for the next run up of the plough.

In our yard at Salford Priors, near Evesham, we have an 8 h.p. compound engine which used to have two drums for single-engine ploughing, but the anchor was cut up 25 years ago.

Bidford-on-Avon, Warks. L. HUNT.

SCREWS

SIR,—Many thanks to A. W. Smith for his article, "Cutting Small Screws to Length" [ME, April 25].

I have made a set with washers for BA screws, plus Whit. and BSF up to $\frac{1}{4}$ in. dia. To do this I increased the washers to 0.6 dia. with a 0.525 spigot.

For the mandrel, I kept to the diameter of $\frac{11}{16}$ in., but cut 16 t.p.i., as my lathe, having a leadscrew of 8 t.p.i., made it easier to engage the nut of the saddle.

For the nut, I used a standard $\frac{1}{2}$ in. Whit., and with a bent tool $\frac{1}{8}$ in. wide I cut a recess at the bottom $\frac{11}{16}$ in. in diameter for screw cutting tool clearance.

In addition to cutting screws off to length it will prove useful for pointing or rounding the ends, provided they are short.

Colchester. J. E. FOSTER.

AMAZING LIKENESS

SIR,—I was a regular subscriber to *Ships and Ship Models* before it was withdrawn from publication and subsequently I have only purchased MODEL ENGINEER on odd occasions. It was, therefore, purely by chance that I purchased your issue for June 13 and noticed the picture and paragraphs referring to the *Southern Cross*.

The photograph published looked remarkably like a ship of the same name built some years ago by my old friend E. J. Brooks, who died this year at the splendid age of 94. The model passed from his possession and was known to be in the hands of a troop of sea cadets in the Richmond-Twickenham area, and formed, I believe, part of a display at a Richmond cinema on one occasion.

I enclose the only photograph I can find at the present time of Mr Brooks' model and you will agree that the similarity is truly amazing. The only visible difference is that the ship in your photograph has had skysails added.

One further point is that Mr Brooks' model was not copied from a particular ship, and so far as I know was certainly not made of a piece of ship's timber. There may have been a sailing ship called the *Southern Cross* at some time, although I do not know of it myself.

Wembley, Middx. A. J. LENCH.

MODEL TURBINES

SIR,—I was extremely interested in Mr Mapplebeck's account of his small turbine and I must congratulate him on producing a very nicely laid out and well engineered job. Here, however, the praise must stop.

I sincerely hope that Mr Mapplebeck will take my criticisms as a fellow turbine enthusiast anxious to see a successful plant running on the pond. The first thing I must object to is the efficiency quoted. My own rough estimate is just over 3 per cent, this being a very good figure for a small turbine, and one which compares almost exactly with figures obtained on my own turbine which was, however, intended to produce much more power.

The use of the big stick is well known to produce low efficiency and

POSTBAG . . .

one cannot expect too much from a flash boiler. The figure of 30 lb. steam per h.p. hour is a typical figure for a bad non-condensing reciprocator, so Mr Mapplebeck has compared the efficiency of his turbine with another very inefficient machine.

The overall efficiency will probably be better than my own figure of ½ per cent as his boiler is better than the flash boiler that I used. He has wisely designed his plant to develop modest power and not tried to produce the brute power needed for round the pole work.

Mr Mapplebeck states that he read up the past literature on the subject; why then perpetuate the mistakes made in the past ? The most obvious of these is the use of plain bearings. These are a source of endless trouble and absorb far too much power.

D. H. Chaddock has demonstrated at the ME Exhibition that ball races can be run to 250,000 r.p.m. with reliability. I have used ¼ in. and ⅝ in. races up to 110,000 r.p.m., carrying a 14 oz. rotor.

The blade form used is well tried and has been found wanting many years ago. The De Laval wheel has a maximum possible efficiency of just over 50 per cent. The blades must travel at approx. half steam speed, and this leaves the steam still travelling at a bit less than half its original speed still containing lots of energy. However, if the steam path is lengthened to provide a more advantageous shape, friction creeps in and power is lost that way.

My own experiments, published in ME, show the Stumpf wheel to be more efficient and above all much easier to make. It was also more robust. The same faults are to be found on the Stumpf wheel and the maximum efficiency is about 50 per cent. A serious loss of power occurs in the steam nozzle in very small sizes.

The boundary layer is very thick in proportion to the nozzle diameter, and has an adverse effect on the steam speed. Although the mass flow can be calculated quite accurately by using full size formulas, the steam speed is always far lower than that calculated.

Broadly speaking, I found that steam pressures of over 200 lb. did not produce more power. The high pressures were used solely to get good heat transfer in the boiler.

Mr Mapplebeck's speed of 137,000 r.p.m. is not high enough. It is the tip speed that matters, and in small sizes it is almost impossible to spin the wheel fast enough. My own turbine of 3 in. dia. rotated at 100,000 r.p.m. on load, and this was not really enough, although the tip speed was 1,300 ft. per sec. or nearly 900 m.p.h.

If these high speeds are to be attempted, something better than dural must be used for the rotor. It is very attractive from a machining point of view, but a burst rotor could mean the operator's death, or what is much more serious, a spectator's death. Imagine the repercussions of a spectator being killed at a regatta ! No, only the very best quality steel must be used, and overspeeding tests must be done to cover such a contingency as a broken prop shaft.

The construction of miniature turbines is a fascinating pastime and providing the power expected is not great, they are very satisfactory, being mooth, silent and self starting.

I hope that Mr Mapplebeck will not stop here but press on and build a real power job, breaking fresh ground at the same time. Once again, congratulations.

Fleet, Hants. J. A. Bamford.

MYSTERY ENGINE

Sir,—Knowing the interest of ME readers in anything a little out of the ordinary run, I am sending you this snap of a small enclosed type steam engine. Unfortunately the photo is not quite up to professional standards, due partly to my " finder " being a little out of true.

The engine has two cylinders: 2⅞ in. bore × 2 in. stroke, with two rings on each piston, inside admission piston valves, heads ⅞ in. dia. and grooved as are the spindles. These parts are very white with a high polish and almost look as if they had been plated.

Between the oil filler elbow and the oil level window is cast the letter H—I can find no other indications of its origin. The engine was removed from a tar spraying machine at Kendal, and the machine itself was understood to have been originally assembled locally from available components. Probably one of your readers will recognise the design.

It has features which recommend it as a sound commercial job, the design of which has received the benefit of more experience than is often evinced by small steam engines. It will be noted that the carcase of the engine—cylinders, guides, and crankcase—is one casting.

The top and bottom will have been faced truly parallel, then the cylinder, valve chests and guides bored truly from the faced surfaces.

The crankshaft has circular webs, and two bearings with 1¼ in. dia. journals. The two end plates carrying the bearings are both from one pattern; a ribbed plate forms the bottom cover, through which all the motion parts can be withdrawn (though only after removing the end plates and crankshaft), and a single cover plate closes the cylinder heads and valve chambers. Every nut on the carcase of the engine is ⅜ in. Whit.

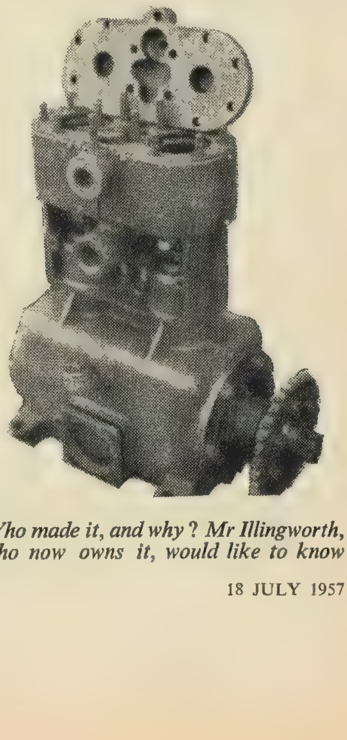
Lubrication is by splash. No reverse is fitted. The chain sprocket is evidently an addition.

The only curiosity about the construction concerns the steam passages between the upper (inlet) boss, the valve chests, and the lower (exhaust) boss.

A bored circular cavity runs through the block opposite these bosses, into which fits a turned hollow sleeve carrying ports cut at an oblique angle into its walls. A threaded hole in the top enables the sleeve to be withdrawn, but a short 1 in. setscrew in the cover immediately over the sleeve, with a hole drilled up its centre, has a purpose which I have so far not been able to fathom.

This engine has not run for some years, but I am hoping to get it going again some day. Meanwhile, I think it is a good object lesson on the workmanlike results to be gained when a design is thoroughly considered before building starts, and as many details as possible incorporated in the basic patterns, rather than copying the method employed by the small birds now making their nests under our eaves, and which seems to be favoured by so many builders of small steam engines !

Penrith, Cumberland. H. A. Illingworth.



Who made it, and why ? Mr Illingworth, who now owns it, would like to know

VINTAGE MODEL

SIR,—Having read about old locomotives in ME I took the enclosed photograph of a model locomotive that has been in my possession for 60 years!

It is 6½ in. overall and 5 in. from rail to top of chimney. One filling of water in the boiler and a filling of meth in the lamp give a run of about 15 min.

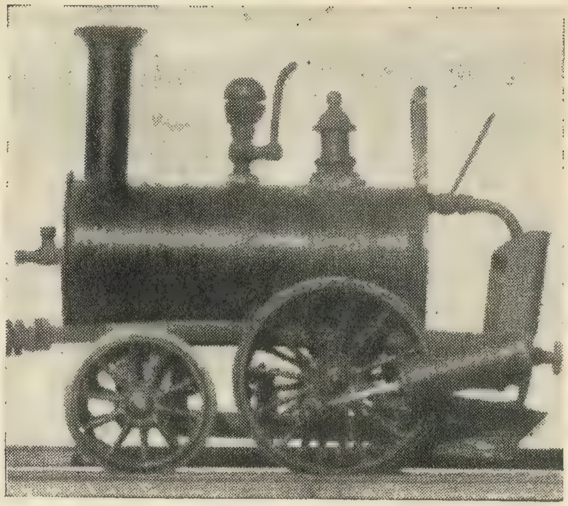
The last run was at the North London exhibition at Barnet some few years ago. I raised steam and put it on the track, and—whoosh!—it just shot down the whole length in a flash. It was lifted and turned round and did the same thing; I then found that the safety valve wasn't functioning!

The main frame appears to be a casting to which the boiler is pressed in at the cab end and held from the buffer beam at the front by a screwed hook. The steam pipe is arranged to screw into the drag beam which is hollow and so to the port face to supply steam to the cylinders.

It was not new when I acquired it so I just do not know how long ago it was made. I altered the gauge from 3⅛ in. to 3½ in. so that it could run on the North London Society's track.

I think this locomotive must have been made long before the *Ajax* and *Thunderer*. Perhaps someone may be able to identify it.

Leigh-on-Sea, Essex. G. H. W. RANDELL.



Mr Randell's vintage model locomotive

HUBS WRONG

SIR,—To see one's name in print brings a wonderful glow, and the issue of ME for June 27 was just such another grand occasion. But on taking a second look at the end sketch of the anchor truck, that glow hastily subsided. The hubs are shown out of centre to the tilted wheels on both sides, which is obviously wrong, or would be when the wheels revolved.

Pray accept my sincere apologies for this.

Professor Oxley will, no doubt, wade in with a lengthy treatise on the advantages of elastic hubs in cast iron wheels.

Sedlescombe, Sussex. GEORGE W. EVES.

CASTINGS

SIR,—I have been making and supplying castings for LBSC locos since 1946 and can count on the fingers of one hand the number of occasions in which I have been at variance or in dispute with customers.

On three occasions I requested the customer to submit the casting or castings (partly machined) to the ME and I would stand by their verdict. On those three occasions I heard nothing more; the customer either funked, or the verdict was in Wilwau's favour.

I am not, however, implying that Mr Clark's *Titfield Thunderbolt* cylinder block [Postbag, June 20] was spoiled in machining. He could have returned the castings; if they were faulty they would have been replaced free of charge. I am not adverse to taking advice where it makes for improvement, but with regard to machining allowance some builders say there is too little to machine off, others make out there is too much to file off. What can one do?

W. H. Rider [same issue] says no names mentioned makes the picture confused. Agreed, but who wants to see Postbag with a mud-spattered border?

Without mentioning any names there are the chaps who think postage is still the same as in the era when their grandads took them for a walk. In all honour to them, most do remit the balance even if it is months after. On many occasions in response to inquiries I have posted off the nearest size wheel casting(s), anything to save time in writing. In a good number of cases Wilwau never received an acknowledgement.

In conclusion, I offer sincere apologies to those I have kept waiting for lists. LBSC's mention of the four-tool turret had something to do with that! I can almost sketch the turret and put in the sizes blindfolded.

Bearsden, Glasgow. W. K. WAUGH.

A CHANCE TO SHINE

ACRES of unpolished floors are very depressing—especially if you have to polish them. But a housewife does in fact cover several acres, or even scores of acres, in the course of a year.

What a dreary business! "Put it on the ground, spread it all around," as the old song has it. Is there a way out of it?

In one of London's Oxford Street stores an electric floor polisher was quoted at £20 recently. Readers of MODEL ENGINEER can build their own polisher (which does double duty as a bench sander incidentally) from the diagrams and instructions in the August issue of *Home Mechanics*, 1s. 3d. from all booksellers. Moreover it could cost virtually nothing as the machine described was built around a second-hand Hoover junior vacuum cleaner.

In the same issue of this practical make-it-yourself magazine there is also a useful article describing the construction of a bench grinder and another gives simple instructions for solid silver napkin rings. Those who like wood turning will welcome Kenneth Blackburn's handsome two-piece condiment set and amateur photographers will be interested in a print drier and glazer.

If you have any difficulty in getting a copy of *Home Mechanics* send 1s. 6d. to the publishers, Percival Marshall and Co. Ltd, 19-20 Noel Street, London, W1.

READERS' QUERIES

Do not forget the query coupon on the last page of this issue

This free advice service is open to all readers. Queries must be on subjects within the scope of this journal. The replies published are extracts from fuller replies sent through the post: queries must not be sent with any other communications: valuations of models, or advice on selling, cannot be given: stamped addressed envelope and query coupon with each query. Mark envelope "Query," Model Engineer, 19-20 Noel Street, London, W1.

Propeller efficiency

I am building a model destroyer and would like to know whether efficiency can be improved according to where the propeller is placed in relation to the hull and slip stream.—WG, Glasgow.

▲ *The position of the propeller for a model destroyer is influenced to a great extent by the design of the hull; it is most important that the propeller should be in a position to encounter unbroken water, and any disturbance caused by the contour of the hull will affect propeller efficiency.*

It would be most desirable to keep the propeller, or propellers, well away from the underside in the stern. This position not only results in an undesirable shaft angle but also makes the propeller particularly vulnerable to damage in shallow water or in the event of any floating objects being encountered.

Another point is that the propeller must be well supported by a bearing as close to it as possible so that the resistance of any shaft bracket fitted must be taken into consideration. In some cases instead of a bracket, a long streamlined fairing is extended from the hull to carry the propeller bearing.

Incidentally, one of the most common faults in the position of the propeller is to incline the shaft at a steep angle which almost invariably causes inefficiency. The angle should be as near horizontal as possible consistent with being able to fit the machinery sufficiently low to line up, avoiding, wherever possible, angled joints in the shafting.

Welding and brazing

Could you advise me on the most economical welding and brazing equipment suited to model engineering purposes where town gas is not available? I have considered electric plant, but this is limited to welding and is not cheap, while I have had no success with a paraffin blowlamp for brazing on any but very small work.

Would it be possible to use a vacuum cleaner of the Tellus type, which has a pressure outlet, in conjunction with bottled gas and a gas-air torch for the purpose?—LNJ, Leeds.

▲ *It would appear that the most suitable appliance would be a blowtorch to operate on Calor gas or other bottled gas, but it is not possible to state definitely whether this type of appliance is adaptable to use with forced air supply. However, full information on this subject can be obtained from Calor Gas Ltd, 268 High Road, London, N22, or from Dex Industries, Wee-Dex Works, Edwin Road, Twickenham, Middlesex. Both these firms supply brazing torches for use with bottled gas but without provision for forced air supply. If it is possible to use air supply, the most suitable form of blower would be one of the vane type. Such blowers can be adapted to the purpose and are available on the surplus market.*

A fan blower of the type as used in vacuum cleaners might possibly be satisfactory but the maximum pressure obtainable is much lower than with the vane type of blower.

On lubrication

I am constructing a marine steam plant comprising two Stuart Turner twin launch engines coupled together but am in doubt regarding lubrication. I should be grateful, therefore, if you would answer the following:

1 What type of pump would you recommend and the size?

2 Should the oil be fed into the main steam line before the T-piece leading to each engine, or to a separate lead to each engine at its inlet?

3 Have any articles been published in ME dealing with this subject?—JGM, Lympsham, Somerset.

▲ 1 *A type of pump which would be very suitable for this purpose is the ratchet operated mechanical pump, as extensively used on model locomotives. Pumps of this type have been described on several occasions by LBSC, in connection with various designs of locomotives. The size of pump would depend very largely on the length of time the engine is required to run, though the oil reservoir size could be varied as required. The rate of oil feed can be varied within fairly wide limits by varying the number of teeth in the ratchet wheel or the number of teeth advanced at each stroke of the ratchet lever.*

2 *It is generally found quite satisfactory to feed the oil into the main steam pipe before the branch leading to each engine or cylinder, but in some cases unequal distribution of oil is experienced, in which case the remedy would be to use a separate lead to each engine.*

3 *No articles dealing specificially with the use of a mechanical lubricating pump for Stuart Turner or other marine engines have been published, but a good deal of information has been given on the use of such pumps on locomotives in which conditions are generally very similar.*

Boiler close-riveting

I have a 3½ in. gauge *Royal Scot* half completed; the chassis has been fairly straightforward, but the boiler is presenting a bit of a problem. All the boiler plates have been shaped up and flanged to LBSC's drawing. But since I have no facilities to braze or silver solder, can I close-rivet this boiler without the use of soft solder as a caulking? I have a great mistrust of this material at 60 p.s.i.—FCT, Earley, Berks.

▲ *There is no reason why you should not close-rivet the whole boiler but no matter how well this process is done some caulking will be absolutely necessary—and nothing is more suitable for this purpose than good tinman's solder.*

Building Ivy Hall

I wish to build a 5 in. gauge passenger hauling locomotive, using the GW 4900 Hall class for a prototype.

Is LBSC's *Ivy Hall* suitable for this project? If so, are drawings available for it and at what date was it serialised in ME?—RT, Leamington Spa, Warwicks.

▲ *LBSC's* IVY HALL *is quite suitable for a 5 in. gauge passenger hauling locomotive, although it is not a scale model of the prototype. Greenly Models Ltd, of 66 Heston Road, Hounslow, provide working drawings for a 5 in. gauge Hall class engine which is a close copy of the prototype and makes a very powerful model. It could be built by following LBSC's series on* IVY HALL, *which was published in* MODEL ENGINEER *between October* 1955 *and June* 1956, *volumes* 113 *and* 114.

PHOTOGRAPHIC COMPETITION

ENTRY FORM

(To be pasted on the back of each entry)

Name...
(Block letters)

Address..

....

If member of a club, give its name ....

....

I agree to the conditions and certify that I took the picture submitted.

Signed...

DETAILS OF PHOTOGRAPH

Title ....

Builder of model(s) in picture:

Name ....

Address ....

....

Further details of model(s)..........................

....

....

Camera..................... Exposure...............

Film or plate............ Lighting.....................

Stop.................

Any other information ....

....

....

CLUB NEWS

EDITED BY THE CLUBMAN

ALL modelling club affiliations and federations in Britain—and all secretaries of similar bodies overseas—are invited to the annual conference on the last day of the Model Engineer Exhibition. This year's host is the South Wales and Monmouthshire Federation of Model Clubs and Societies, whose own exhibition in Cardiff last autumn (ME, October 18) very strikingly proved the strength and keenness of the modelling movement in that busy and important part of the British Isles.

R. S. Page of 11 Twyn-y-Fedwen Road, Gabalfa, Cardiff, himself the keenest of secretaries, would like to have the addresses of all federation secretaries as soon as possible. Secretaries of similar federations in other countries are also invited to make themselves known when—or before—they visit the New Horticultural Hall at Westminster where MODEL ENGINEER has again provided a room for the conference—on Saturday, August 31.

Secretaries are asked to notify Mr Page of any matters which they wish to have on the agenda.

They're "covered"

All clubs and individuals belonging to the South Wales and Monmouthshire Federation are now covered for personal accidents and third-party risks. Details were given at the annual general meeting when S. D. Williams, as acting chairman, had a year of progress to report.

There was a special welcome at the meeting for the **Ebbw Vale** club, which had joined the federation; and Ebbw Vale in turn announced that it had a welcome for all affiliated clubs this summer. There is great interest in model yacht racing and aircraft flying at Ebbw Vale.

MPBA's REGATTA

All countries are also invited to take part in the MPBA radio-control regatta at Brockwell Park, Herne Hill, London. Overseas competitors, and those who are not members of the association, are asked to enter in advance.

The programme opens at 11 a.m. on July 21 with a set course steering event. The Taplin Trophy competition for radio-control speedboats follows, on lines already announced.

Any competitor who is doubtful on a point should communicate with secretary J. H. Benson at 25 St John's Road, Sidcup, Kent. Time being short, I will add his telephone number: Footscray 7428.

STILL ANOTHER INVITATION

Pegben Brothers, the agricultural and general engineers at Elham, Canterbury, are holding their annual steam engine rally at the works on August 3. The programme opens at 3 p.m.

"There will be something to interest anyone with a mechanical mind," says A. G. Pegben—obviously a reader of ME.

ME DIARY

July 20 Huddersfield SME track at Greenhead Park for summer entertainments (July 20-Aug. 4).

SMEE "Portable Steam Engines," W. J. Hughes, 14 Rochester Row, Westminster, 2.30 p.m.

The West of England Steam Engine Society steam traction engine rally and model engineering exhibition, Lanvain Farm, Camborne (V. H. Carveth, Barncoose, Redruth, Cornwall), open 2 p.m.

July 21 Southend MPBC local regatta, 2.30 p.m.

IRCMS at Kingsley Hotel, London.

Worcester and District public running day, Diglis, 11 a.m.

MPBA radio-control regatta, Taplin Trophy. Birmingham SME visit to Derby Works and Museum.

July 22 Thomas Telford Bicentenary Exhibition, ICE, London (opening by Minister of Power); July 22-Aug. 10, 10 a.m.-8 p.m.

July 26 North London SME loco section at HQ, 8 p.m.

July 27 Kegworth Carnival and Traction Engine Rally, 12.15 p.m.

REC camping coach holiday, Ferryside, Carmarthen (July 27-Aug. 3).

July 28 MPBA Regatta, Southend, 11.30 a.m.

Brighouse SMEE Visiting Day, Ravensprings Park, Brighouse, Yorks.

July 31 North London SME Aeros and Marine combined section meeting, B. and D.W. Co., 8 p.m., min. railway section at HQ.

CONDITIONS OF ENTRY

1. The photographs submitted shall be of any form of model engineering and must be taken by the competitor but may be developed commercially. Prints should be unmounted, not more than 10 in. x 8 in. and no less than half-plate (4¾ in. x 6½ in.).
2. Competitors may send more than one photograph but each must have a coupon from Model Engineer firmly pasted on the back. Coupons will be published each week until the closing date.
3. The closing date will be July 31. Entries to be sent to: Photographic Competition, Model Engineer, 19-20 Noel Street, London, W1.
4. A first prize of £10 will be provided, with second prize of £5 and third of £3. In addition, 10s. 6d. will be paid for each other photograph published in Model Engineer.
5. Prints will not be returned and the Editor reserves the right to publish any of them in Model Engineer.
6. Copyright of photographs sent must rest with the competitor.
7. The decision of the Editor shall be final in any question affecting the competition.

Model Engineer

Classified Advertisements together with remittance should be sent to Model Engineer, 19/20, Noel Street, London, W.1, by latest Thursday morning prior to date of publication. Advertisements will be accepted from recognised sources by telephone. GERRARD 8811. Ex. 4

CLASSIFIED ADVERTISEMENTS

★ Private: 3d. per word. Trade: 6d. per word. Minimum 12 words. Use of box 1s. 0d. extra.

★ Rates for displayed advertising in this section. Trade 35s., Staff 45s., per single column inch. (Column width 1⅝ in.)

The Advertisement Manager reserves the right to refuse or suspend advertisements without giving any reason. Every care is taken to avoid mistakes, but the publishers cannot be held liable in any way for printing errors or omissions. Receipt of "copy" for publication implies acceptance of these conditions by the advertiser. Whilst every care is taken to exclude advertisements from doubtful sources, no responsibility can be accepted by the publishers for the bona fides of advertisers.

WORKSHOP EQUIPMENT

Buck & Ryan for Lathes and Workshop Accessories, drilling machines, grinders, electric tools, surface plates, etc.—310-312, Euston Road, London, N.W.1. Phone: Euston 4661.

Good Cash Prices offered for old "Atlas" 5″ lathes (or similar) or can be used against the supply of a new machine of any make with balance over hire purchase 12, 18 or 24 months. Write with details of make and condition, equipment offered and price required to—THE ACORN MACHINE TOOL Co. (1936) LTD., 610-614, Chiswick High Road, W.4 or telephone CHIswick 3416.

Immediate Delivery from Stock, Myford "ML7" and "Super 7" lathes, Super Adept lathes, bench planers, shapers, electric motors, small tools.—F. W. KUBACH, 12, Sylvan Road, London, S.E.19. LIV 3311-12.

3½ h.p. Lister Engine with countershaft and 12 volt lighting set. 3½″ Myford lathe with stand and accessories, pedestal drilling machine, grindstone, buffer, air compressor, and hand shaper with dividing head. All in perfect condition, £150 o.n.o.—BRYANT, Burleigh, Fir Acre Road, Ash Vale, Aldershot.

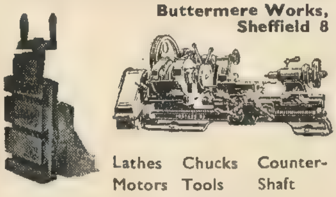
Contents Workshop. Precision "Star" lathe, 9″ swing, chucks, tools. Sole user, bought new, £100. Seen—7, Pinewood Road, Newton Abbot.

£65 Myford Super 7, motorised, 3-jaw, drill chucks, various tools, very little used. —2, Isabella Road, Homerton, London, E.9.

Jigsaw Table 8″ × 6″, throat 8½″. Uses Eclipse Junior or coping saws, 3-speed countershaft, £5 10s., photo.—Box No. 8563, MODEL ENGINEER Offices.

Motorised ML7, chucks, vertical slide, many accessories. ½″ bench drill. 3½″ Adept shaper. 4½″ Selecta grinder, micrometers, numerous H.S.S. tools, about 45 M.E. handbooks, over 400 MEs, £80 the lot. Going abroad.—SGT. HUDSON, R.E.M.E., 13, Cotteshore, Bordon, Hants.

CHARLES PORTASS & SON
Buttermere Works, Sheffield 8



Lathes Chucks Counter-Shaft Motors Tools

"Atlas" capstan/turret tooling for any make of machine, new, at ridiculously low prices. Send for fully illustrated, descriptive and priced leaflet to—THE ACORN MACHINE TOOL Co. (1936) LTD., 610/614, Chiswick High Road, W.4. (Telephone No. CHIswick 3416, 5 lines.)

Lathe Chucks, new, 4-jaw independent, in makers' pack, sizes "Burnerd" 3¼″, 67s. 6d. "Belco" 4″, 75s., 4½″ H.D., 80s., 8″, £7, 10″, £9, 16″, £16. Also "Acorntools" 6″, 80s. Orders and cheques to—THE ACORN MACHINE TOOL Co. (1936) LTD., see advertisement above.

Ward Capstan, motorised milling machine, power press, B. & S. auto, nibbler, lathe.—M. VALMAR, 21, Rousden Street, Camden Road, London, N.W.1.

Myford ML7, motorised, very little used, chucks, tools, small electric grinder, £50.—19, Brookmead, Hildenborough, Kent.

Shapers, All-geared with Motors and vices, £75. Also face milling cutter bodies, wedges and screws, suitable for ⅜″ square tools, 4″ and 6″ dia., £3 and postage.—WAVENEY MACHINE TOOLS, 48, Staithe Road, Bungay, Suffolk.

For Sale. Emco-Unimat lathe with milling table, G.S. 3-jaw chuck, Jacobs chuck, drilling pillar, circular saw table and 2 blades, grinding arbor, faceplate and driver, live and dead centres. Jig saw complete, 3 new Eclipse tools and spare belts, all in wood cabinet. Mint condition. £40 o.n.o.—FROST, "The Nook," Bradford Road, Menston, near Leeds, Yorks.

Atlas Lathe 3″ B.G.S.C. taper roller headstock. 3-jaw chucks, motor, bench, vert. slide, steadies, capstan attachments, c./shaft, numerous accessories, £30.—Phone Hatfield 2048, 9, Orchard Mead, Hatfield, Herts.

Saw Bench, 6″, circular ball bearing, rise/fall, tilting table. Motorised 240/1/50. Nice job, £15. Wolf chisel mortising stand, chisels and ⅜″ drill. All as new, £25 (cost £44).—MOLDON, 366, King Street, London, W.6.

Lathe S.S.S.C. 4⅜″, 34″ between Selfact sliding surfacing hollow mandrel, 3 chucks, C.I. pedestal, motorised, seen working, flat vee bed, complete set wheels, £50—Box No. 8571, MODEL ENGINEER Offices.

MODELS AND FITTINGS

Retiring! Model Engineer has for sale two 7¼″ gauge locos. One Burrell 4 h.p. steam tractor. Reasonable offers.—W. D. HOLLINGS, Birkenshaw, Yorks. Telephone: Dudley Hill 299.

We Have a Large Stud of the highest quality engineer built live steam passenger-hauling locomotives. Send for list—free on receipt of 2½d. stamp. We effect overhauls and repairs of the highest standards to live steam items. We are interested in the purchase of all types of locomotives, traction engines, showman's engines, stationary engines, etc.—CHERRY'S (SURREY) LTD., 62, Sheen Road, Richmond, Surrey. Tel.: RIChmond 2454.

KENNION'S CATALOGUES

Tool and Materials 9d.
L.B.S.C. Blueprint & Castings. 1s.
Refunded on first 20/- order
3½″ G. Handrail Knobs
3s. 6d. dozen
OVERSEAS ORDERS A SPECIALITY
2 Railway Place, Hertford *Phone 2573*

Required for Hospital Garden Fete for September 14th model railway which carries passengers. Send details of hiring costs, etc.—MRS. A. CROSS, 15, Kirkdale Road, Leytonstone, London, E.11.

2½″ Gauge "Green Arrow" exhibition finish, first class condition, will haul four adults, complete with 66′ raised, portable wooden track, 2½″ and 5″ gauge and double bogie, ball bearing, upholstered passenger truck for four with brakes. The lot, £120. Buyer collects.—Box No. 8577, MODEL ENGINEER Offices.

ELECTRICAL

A.C. Motors Self Start, induction 200/250 volts, 50 cycles, 1-phase, 1,425 r.p.m., ¼ h.p., £4 2s. 6d., 1/3 h.p., £4 19s. 6d., ½ h.p., £6 15s. Perfect and guaranteed. Carriage extra.—JOHNSON ENGINEERING COMPANY, 319, Kennington Road, S.E.11. Reliance 1412/3.

New ½ h.p. Electric Motors, 1-ph., 200/210 volt, £5 15s., 3-ph., 400/440 volt, £5 5s., delivered. Genuine surplus.—LADYBRIDGE CABINET WORKS, Hunslet Road, Leeds, 10.

D.C. Generators, 1,100 r.p.m., compound wound, 32 volt, 13 amp, £5 10s. 32 volt, 6 amp, £4 10s. 50 volt, 11 amp, £6 10s. All as new. Met.-Vick, General Electric, etc.—W. MOLDON, 366, King Street, London, W.6.

GENERAL

Guaranteed ! Easy-Home Constructed Refrigeration. Genuine domestic components. Not secondhand ice cream scrap. Modern hermetic G.E.C. units, gas, electric and oil silent unit. Everything for refrigeration. Complete specialists. Send s.a.e. for free illustrated " Sealed system " leaflet or 1s. for complete catalogue (refunded with first order).—BRAID BROS., 50, Birchwood Avenue, Hackbridge, Surrey. Phone : Wallington 9309.

Precision Engineers. Want ideas, patents bought.—Box No. 8399, MODEL ENGINEER Offices.

Watch and Clock Lathes, cleaning machines, staking tools, etc. (Large illustrated catalogue and price list, 4s. 6d.). Easy payment terms available. Special offer Model 32 " Burnerd " 3-jaw reversible 2½" chucks with 8 mm. collet adaptors, £4 2s. 10d. p.p.—JOHN MORRIS (CLERKENWELL) LTD., 64, Clerkenwell Road, London, E.C.1. (Best prices paid for used watches.)

Compressors for Sale. Two pistons complete with air receiver, driving wheel and motor cradle, 180 lb., 2½ cu. ft., price £3. Motors a.c. and d.c. all types ¼ h.p., £3. Carriage forward.—WHEELHOUSE, 13, Bell Road, Hounslow. 'Phone : Hounslow 3501.

Air Compressors, tanks and accessories at far below list, from £5 17s. 6d., TV and lighting generator from £15.—TEDDINGTON, ENGINEERING CO. LTD., 29-31, High Street, Teddington, Middx. Tel.: Kingston 1193.

Figure Photography approved service for enthusiasts. S.A.E. details.—BCM/NUART, London, W.C.1.

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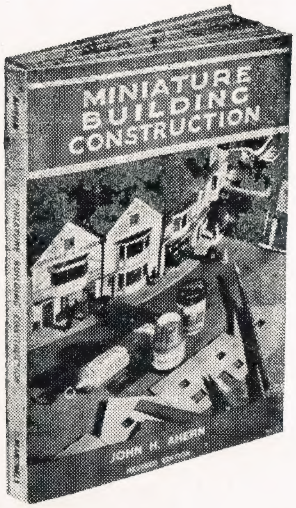

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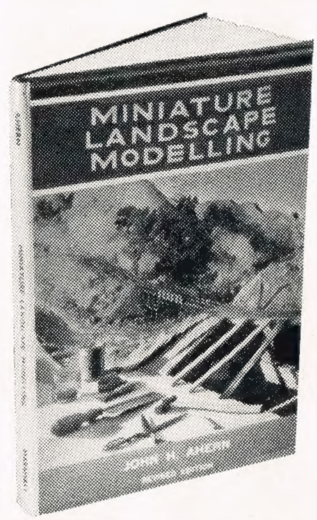

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